



Campus Curricula Committee Meeting Agenda

January 9th, 2018

8:30am - 10:00am, 106 Parker Hall

(For Faculty Senate Meeting of January 25, 2018)

Review of submitted Course Change forms:

File: 2151.1	BIO SCI 2263: Ecology
File: 1513.1	BIO SCI 2383: Plant Biology
File: 2531.1	BIO SCI 3233: Evolution
File: 1843.1	BIO SCI 3313: Microbiology
File: 4501	CHEM ENG 6180: Advanced Applications of Computational Fluid Dynamics
File: 4070.7	CIV ENG 5515: Advanced Traffic Operations and Capacity Analysis
File: 4479	CIV ENG 5635: Phytoremediation and Natural Treatment Systems: Science and Design
File: 110.2	COMP SCI 1200: Discrete Mathematics for Computer Science
File: 774.1	ECON 6440: Advanced Environmental and Natural Resource Economics
File: 1737.1	ECON 6540: Advanced Energy Economics
File: 4499	FINANCE 5310: Financial Modeling
File: 2391.6	IS&T 4335: Fundamentals of Mobile Technology for Business
File: 1871.6	IS&T 6335: Mobile Technology for Business
File: 2342.7	PSYCH 5010: Seminar for Industrial/Organizational Psychology
File: 4500	PSYCH 5020: Introduction to Industrial-Organizational Psychology
File: 719.1	SYS ENG 6110: Risk Modeling and Optimization under Uncertainty

Review of submitted Degree Change forms:

File: 143.20	ARC ENG-BS: Architectural Engineering BS
File: 230.12	AUTOENG-MI: Minor in Automation Engineering
File: 156.7	GE ENG-BS: Geological Engineering BS
File: 238.6	HCI-MI: Human-Computer Interaction and User Experience Minor
File: 234.20	INORGPS-MS: Industrial Organizational Psychology MS
File: 121.1	PRE LAW-MI: Pre Law Minor
File: 255	PROPOSED: Business Applications and Software Development Minor
File: 256	PROPOSED: Minor in Financial Technology (FinTech)

Review of submitted Experimental Course forms:

File: 4492	BIO SCI 5001.001: Ichthyology
File: 4497	BIO SCI 5001.002: Population and Conservation Genetics
File: 4491	CIV ENG 4001.001: Infrastructure Sustainability through Recycling
File: 4490	CIV ENG 6001.002: Pavement Management, Evaluation and Rehabilitation
File: 4494	COMP SCI 3001.002: Introduction to Data Science
File: 4496	ELEC ENG 3001.001: Intelligent Robotics
File: 4488	ELEC ENG 6001.006: Introduction to Nonlinear Optics



File: 4504
File: 4502
File: 4498

HISTORY 3001.003: Slavery in the Atlantic World
MECH ENG 6001.002: Fundamentals of Metal Additive Manufacturing Processes
NUC ENG 2001.001: Professional Development for Nuclear Engineers

Review of tabled items:

File: 942.1 ARCH ENG 4800: Principles of HVAC I
File: 2069.5 ARCH ENG 4820: Building Lighting Systems
File: 4219.5 ARCH ENG 4850: Building Electrical Systems
File: 4440 CHEM ENG 4001.001: Introduction to Phase Equilibrium
File: 249 PROPOSED: Master of Science in Explosives Technology

Discussion on the proposed catalog language to be included in “The Approved List of Humanities and Social Sciences Courses for Engineering Degrees” within undergraduate engineering degree programs:

Engineering degree programs will have a minimum of 21 credit hours of humanities/social-sciences as specified below. Many engineering degree programs will require specific humanities and social sciences courses to meet the requirements below. Specific engineering programs should be reviewed for their added requirements. Engineering degree programs shall include:

- ENGLISH 1120
- HISTORY 1200 or HISTORY 1300 or HISTORY 1310 or POL SCI 1200
- ECON 1100 or ECON 1200
- Communication Elective: ENGL 1160 or ENGL/TCH COM 1600 or ENGL 3560 or SP&M 1185
- The remaining minimum of 9 additional credit hours must be three-credit hour lecture courses offered in disciplines in the humanities and social sciences.* Humanities courses are defined as those in: Art, English and Technical Communication, Etymology, Foreign Languages, Music, Philosophy, Speech and Media Studies, and Theatre. Social Sciences courses are defined as those in: Economics, History, Political Science, and Psychology. Some curricula may require the completion of a specified number of upper-level Humanities/Social Sciences (H/SS) courses. Upper-level H/SS courses are defined as those at the 2000-level or above, and that require as a prerequisite the successful completion of a lower-level H/SS course. Study abroad courses may count as upper-level H/SS courses, even if they do not have a prerequisite. H/SS courses numbered 2001, 3001, and 4001 (experimental courses) may also be used to complete these elective requirements.

Courses in business, education, information science and technology, or any other discipline not listed above will **not** satisfy the humanities/social sciences elective requirement, although such courses may count toward general education requirements. Transfer credits from other universities in sociology and general humanities may count as humanities or social science electives.

Course Change Request

Date Submitted: 10/20/17 1:38 pm

Viewing: **BIO SCI 2263 : Ecology**

File: 2151.1

Last edit: 10/23/17 10:27 am

Changes proposed by: shannonk

In Workflow

1. **RBIOLSCI Chair**
2. **CCC Secretary**
3. **Sciences DSCC Chair**

Programs

referencing this course

[BIO SC-BA: Biological Sciences BA](#)

[BIO SC-BS: Biological Sciences BS](#)

[ECON-BS: Economics BS](#)

[EV ENG-BS: Environmental Engineering BS](#)

[GEOL-MI: Geology Minor](#)

[SCTCPL-MI: Science, Tech,& Politics Minor](#)

[TCH COM-BS: Technical Communication BS](#)

4. **Pending CCC Agenda post**

5. **CCC Meeting Agenda**

6. Campus Curricula Committee Chair

7. FS Meeting Agenda

8. Faculty Senate Chair

9. Registrar

10. CAT entry

11. Peoplesoft

Other Courses

referencing this course

In The Prerequisites:

[BIO SCI 4363 : Freshwater Ecology](#)

[BIO SCI 5423 : Advanced Biodiversity](#)

[BIO SCI 5463 : Global Ecology](#)

Approval Path

1. 10/20/17 1:45 pm
David Duvernell (duvernelld):
Approved for

RBIOLSCI Chair

2. 10/23/17 10:27 am

Brittany Parnell

Requested

Fall 2018 08/01/2014

Effective Change

Date

Department

Biological Sciences

Discipline

Biological Sciences (BIO SCI)

Course Number

2263

Title

(ershenb):

Approved for CCC

Secretary

3. 11/17/17 12:17

pm

Katie Shannon

(shannonk):

Approved for

Sciences DSCC

Chair

4. 11/21/17 3:25 pm

Brittany Parnell

(ershenb):

Approved for

Pending CCC

Agenda post

Ecology

Abbreviated

Ecology

Course Title

Catalog

Description

Relationships between organisms and the environment. Topics include the influence of environmental factors on individual organisms, population dynamics, interspecific associations, and entire ecosystems.

Prerequisites

Bio Sci 1113 or Bio Sci **1213 or Bio Sci 1223.** ~~1213.~~

Field Trip

Statement

Credit Hours

LEC: 3

LAB: 0

IND: 0

RSD: 0

Total: 3

Required for
Majors No

Elective for
Majors No

Justification for
change:

We are adding Biodiversity as an acceptable prerequisite for this course

Semesters
previously
offered as an
experimental
course

Co-Listed
Courses:

Course Reviewer
Comments

Course Change Request

Date Submitted: 10/20/17 1:41 pm

Viewing: **BIO SCI 2383 : Plant Biology**

File: 1513.1

Last edit: 10/20/17 1:41 pm

Changes proposed by: shannonk

In Workflow

1. **RBIOLSCI Chair**
2. **CCC Secretary**
3. **Sciences DSCC Chair**

Other Courses
referencing this
course

In The Catalog Description:

[BIO SCI 2389 : Plant Biology Laboratory](#)

In The Prerequisites:

[BIO SCI 2389 : Plant Biology Laboratory](#)

4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**

6. Campus Curricula
Committee Chair

7. FS Meeting
Agenda

8. Faculty Senate
Chair

9. Registrar

10. CAT entry

11. Peoplesoft

Requested **Fall 2018 ~~08/01/2014~~**

Effective Change

Date

Department

Biological Sciences

Discipline

Biological Sciences (BIO SCI)

Course Number 2383

Title

Approval Path

1. 10/20/17 1:44 pm
David Duvernell
(duverneld):
Approved for
RBIOLSCI Chair

2. 10/23/17 10:28
am
Brittany Parnell

(ershenb):
Approved for CCC
Secretary

3. 11/17/17 12:18
pm

Katie Shannon
(shannonk):
Approved for
Sciences DSCC
Chair

4. 11/21/17 3:25 pm
Brittany Parnell

(ershenb):
Approved for
Pending CCC
Agenda post

Plant Biology

Abbreviated Plant Biology

Course Title

Catalog

Description

An intermediate class covering plant form and function. Topics include the cellular structures unique to plants, their life cycles, and the mechanisms they use to survive, reproduce, and convert solar energy into a form usable by all other organisms.

Prerequisites

Bio Sci 1113 or Bio Sci **1213 or Bio Sci 1223.** ~~1213.~~

Field Trip

Statement

Credit Hours

LEC: 3

LAB: 0

IND: 0

RSD: 0

Total: 3

Required for
Majors

No

Elective for
Majors

Yes ~~No~~

Justification for
change:

we are adding Biodiversity as an acceptable prereq for this course

Semesters
previously
offered as an
experimental
course

Co-Listed
Courses:

Course Reviewer
Comments

Key: 1513

[Preview Bridge](#)

Course Change Request

Date Submitted: 10/20/17 1:37 pm

Viewing: **BIO SCI 3233 ~~2233~~: Evolution**

File: 2531.1

Last edit: 10/23/17 10:31 am

Changes proposed by: shannonk

Requested **Fall 2018 ~~08/01/2014~~**

Effective Change

Date

Department

Biological Sciences

Discipline

Biological Sciences (BIO SCI)

Course Number **3233 ~~2233~~**

Title

In Workflow

1. **RBIOLSCI Chair**

2. **CCC Secretary**

3. **Sciences DSCC
Chair**

4. **Pending CCC
Agenda post**

5. **CCC Meeting
Agenda**

6. Campus Curricula
Committee Chair

7. FS Meeting
Agenda

8. Faculty Senate
Chair

9. Registrar

10. CAT entry

11. Peoplesoft

Approval Path

1. 10/20/17 1:44 pm

David Duvernell
(duverneld):

Approved for
RBIOLSCI Chair

2. 10/23/17 10:31
am

Brittany Parnell

(ershenb):
Approved for CCC
Secretary

3. 11/17/17 12:18
pm

Katie Shannon
(shannonk):
Approved for
Sciences DSCC
Chair

4. 11/21/17 3:25 pm
Brittany Parnell

(ershenb):
Approved for
Pending CCC
Agenda post

Evolution

Abbreviated Evolution

Course Title

Catalog

Description

A survey of the genetic and environmental mechanisms associated with organic evolution.

Prerequisites

Bio Sci 2223 General Genetics.

Field Trip

Statement

Credit Hours

LEC: 3

LAB: 0

IND: 0

RSD: 0

Total: 3

Required for

No

Majors

Elective for No

Majors

Justification for
change:

We are adding a Genetics prerequisite because it is important for students to understand mutations before they learn evolution. We are making this course 3000 level since it now requires a 2000 level prereq.

Historically this course was offered at an introductory level, without prerequisites, to provide a survey of evolutionary theory for majors and non-majors students.

Most students who actually take the course are biology majors. Going forward, we wish for this course to provide a synthesis of biological principles after students (primarily biology majors) have completed more introductory biology courses. For this reason, we wish to add the prerequisite of general genetics.

Semesters

previously
offered as an
experimental
course

Co-Listed

Courses:

Course Reviewer

Comments

Course Change Request

Date Submitted: 10/20/17 1:39 pm

Viewing: **BIO SCI 3313 : Microbiology**

File: 1843.1

Last edit: 10/23/17 10:32 am

Changes proposed by: shannonk

In Workflow

1. **RBIOLSCI Chair**
2. **CCC Secretary**
3. **Sciences DSCC Chair**

Programs
referencing this
course

[BIOMED-MI: Biomedical Engineering Minor](#)

Other Courses
referencing this
course

In The Prerequisites:

[BIO SCI 3319 : Microbiology Lab](#)

[BIO SCI 4313 : Introduction to Environmental Microbiology](#)

[BIO SCI 6513 : Advanced Microbial Metabolism](#)

4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**

6. Campus Curricula
Committee Chair

7. FS Meeting
Agenda

8. Faculty Senate
Chair

9. Registrar

10. CAT entry

11. Peoplesoft

Requested **Fall 2018 ~~08/01/2014~~**

Effective Change

Date

Department
Biological Sciences

Discipline
Biological Sciences (BIO SCI)

Course Number 3313

Approval Path

1. 10/20/17 1:44 pm
David Duvernell
(duvernell):
Approved for
RBIOLSCI Chair
2. 10/23/17 10:32
am
Brittany Parnell

Title

(ershenb):
Approved for CCC
Secretary
3. 11/17/17 12:18
pm
Katie Shannon
(shannonk):
Approved for
Sciences DSCC
Chair
4. 11/21/17 3:25 pm
Brittany Parnell
(ershenb):
Approved for
Pending CCC
Agenda post

Microbiology

Abbreviated Course Title Microbiology

Catalog

Description

General introduction to the culture and study of microorganisms, their physiology, structure, and contribution to biology.

Prerequisites

Chem 1320 and Bio Sci 2213. ~~Chem-1320.~~

Field Trip

Statement

Credit Hours

LEC: 3

LAB: 0

IND: 0

RSD: 0

Total: 3

Required for
Majors

No

Elective for
Majors

No

Justification for
change:

We are adding Cell Biology Bio Sci 2213 as a prerequisite for this 3000 level course

Semesters
previously
offered as an
experimental
course

Co-Listed
Courses:

Course Reviewer
Comments

Key: 1843

[Preview Bridge](#)

Course Change Request

New Course Proposal

Date Submitted: 11/28/17 6:20 am

Viewing: **CHEM ENG 6180 : Advanced**

Applications of Computational Fluid Dynamics

File: 4501

Last edit: 12/04/17 1:34 pm

Changes proposed by: smithjose

Requested Fall 2018

Effective Change

Date

Department Chemical and Biochemical Engineering

Discipline Chemical Engineering (CHEM ENG)

Course Number 6180

Title

In Workflow

1. **RCHEMENG Chair**
2. **CCC Secretary**
3. **Engineering DSCC Chair**
4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. CAT entry
11. Peoplesoft

Approval Path

1. 11/28/17 5:30 pm
Muthanna Al-Dahhan (aldahhanm):
Approved for
RCHEMENG Chair
2. 11/29/17 11:38 am
Brittany Parnell

(ershenb):
 Approved for CCC
 Secretary
 3. 12/04/17 1:34 pm
 scraper: Approved
 for Engineering
 DSCC Chair
 4. 12/07/17 9:18 am
 Brittany Parnell
 (ershenb):
 Approved for
 Pending CCC
 Agenda post

Advanced Applications of Computational Fluid Dynamics

Abbreviated Course Title Advanced CFD Application

Catalog

Description

Advanced applications of CFD analyses is presented to investigate mass, momentum and heat transport in complex geometries with general initial and boundary conditions. Students will gain practical experience using commercial CFD codes and learn and apply a general algorithm for solving challenging industrial problems using tutorials.

Prerequisites

Chem Eng 5100 and Chem Eng 4150.

Field Trip

Statement

Credit Hours LEC: 3 LAB: 0 IND: 0 RSD: 0

Total: 3

Required for
 Majors No

Elective for Yes

Majors

Justification for

new course:

This course has been taught the last three years in Chemical Engineering as an experimental course which students from Chemical Engineering, Nuclear Engineering and Petroleum Engineering have taken. CFD is commonly used by engineers to solve difficult industrial problems and is routinely used by academic researchers to understand complex transport processes involving heat, mass and momentum transfer. This course teaches an algorithmic approach to setting up and solving CFD problems using commercial software packages commonly used in industry and academia that will better prepare them for future success in their chosen career.

Semesters

previously

offered as an

experimental

course

Enrollment: Spring 2015- 14, Spring 2016- 16, Spring 2017- 6

Co-Listed

Courses:

Course Reviewer

Comments

sraper (12/04/17 1:33 pm): checked "elective for majors"

sraper (12/04/17 1:34 pm): simplified prereqs.

Key: 4501

[Preview Bridge](#)

Course Change Request

Date Submitted: 09/18/17 11:15 am

Viewing: **CIV ENG 5515 : Advanced Traffic
~~Signal~~ Operations and Capacity Analysis**

File: 4070.7

Last approved: 09/22/14 4:14 am

Last edit: 11/21/17 3:08 pm

Changes proposed by: seelyj

Requested **Spring 2018** ~~08/01/2014~~

Effective Change

Date

Department

Civil, Architectural, and Environmental Engineering

Discipline

Civil Engineering (CIV ENG)

Course Number 5515

Title

In Workflow

1. RCIVILEN Chair
2. CCC Secretary
3. Engineering DSCC Chair
4. Pending CCC Agenda post
5. CCC Meeting Agenda
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. CAT entry
11. Peoplesoft

Approval Path

1. 10/03/17 5:04 am
Joel Burken
(burken):
Approved for
RCIVILEN Chair
2. 10/04/17 11:37 am
Brittany Parnell

(ershenb):

Approved for CCC
Secretary

3. 11/21/17 9:55 am
sraper: Approved
for Engineering
DSCC Chair

4. 11/21/17 3:26 pm
Brittany Parnell

(ershenb):

Approved for
Pending CCC
Agenda post

History

1. Sep 22, 2014 by
Debbie Benenati
(dbenenat)

Advanced Traffic ~~Signal~~ Operations **and Capacity Analysis**

Abbreviated Adv **Traf** ~~Traffic-Signal~~ Ops &

Course Title **CA Anlys**

Catalog

Description

This course will **introduces students to advanced traffic operation** ~~discuss the role~~ and **capacity analysis as applied to an urban highway network.** ~~function of traffic signal components: the signal controller, conflict monitor, vehicle detectors, etc.~~ **It will focus on** ~~The course also covers~~ **the operations and management layout** of **freeway and arterials where a signalized** ~~traffic signal hardware at an~~ intersection is **one of** ~~and will discuss~~ **the key elements affecting traffic flow operation and determining highway capacity.** ~~phasing/timing of traffic signals in detail.~~

Prerequisites

Civ Eng ~~CIV-ENG~~-5513.

Field Trip
Statement

Credit Hours LEC: 3 LAB: 0 IND: 0 RSD: 0

Total: 3

Required for
Majors No

Elective for
Majors Yes

Justification for
change:

New faculty would like to update the information for this course.

Semesters
previously
offered as an
experimental
course

Co-Listed

Courses:

Course Reviewer

Comments

sraper (11/21/17 9:55 am): edits to course description as suggested by DSCC members.

Course Change Request

New Course Proposal

Date Submitted: 09/11/17 10:06 pm

Viewing: **CIV ENG 5635 : Phytoremediation and Natural Treatment Systems: Science and Design**

File: 4479

Last edit: 11/13/17 9:58 am

Changes proposed by: burken

Requested Fall 2018

Effective Change

Date

Department

Civil, Architectural, and Environmental Engineering

Discipline

Civil Engineering (CIV ENG)

Course Number 5635

Title

In Workflow

1. RCIVILEN Chair
2. CCC Secretary
3. Engineering DSCC Chair
4. Pending CCC Agenda post
5. CCC Meeting Agenda
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. CAT entry
11. Peoplesoft

Approval Path

1. 10/03/17 5:04 am
Joel Burken
(burken):
Approved for
RCIVILEN Chair
2. 10/09/17 8:50 am
Brittany Parnell
(ershenb):

- Rollback to
RCIVILEN Chair
for CCC Secretary
- 3. 11/08/17 9:48 pm
Joel Burken
(burken):
Approved for
RCIVILEN Chair
- 4. 11/09/17 10:38
am
Brittany Parnell
(ershenb):
Approved for CCC
Secretary
- 5. 11/21/17 9:55 am
sraper: Approved
for Engineering
DSCC Chair
- 6. 11/21/17 3:26 pm
Brittany Parnell
(ershenb):
Approved for
Pending CCC
Agenda post

Phytoremediation and Natural Treatment Systems: Science and Design

Abbreviated Phytoremediation

Course Title

Catalog

Description

Students learn the scientific basics of chemical transport in soil and groundwater and learn fundamental plant physiology and processes. Students then learn how

these processes are utilized in design of phytoremediation and natural treatment systems, including the most up to date literature and design guidance available.

Prerequisites

Env Eng 3615 or Civ Eng 3615.

Field Trip

Statement

Credit Hours LEC: 3 LAB: 0 IND: 0 RSD: 0

Total: 3

Required for No

Majors

Elective for Yes

Majors

Justification for

new course:

Just a colist of EnvEng 5635

Semesters

previously

offered as an

experimental

course

existing course at 5635

Civ Eng 5001: Phytoremediation - Fall 2015 enrollment: 4, Spring 17 enrollment 1

Co-Listed

Courses:

ENV ENG 5635 - Phytoremediation and Natural Treatment Systems: Science and Design

Course Reviewer

Comments

ershenb (10/09/17 8:50 am): Rollback: Clarification needed for Env Eng 5615

ershenb (11/09/17 10:37 am): Per the request of Dr. Burken, added ENV ENG 5635

as the co-list.

sraper (11/13/17 9:58 am): Corrected misspelled abbreviated course title.

Key: 4479

[Preview Bridge](#)

Course Change Request

Date Submitted: 11/08/17 12:11 pm

Viewing: **COMP SCI 1200 : Discrete Mathematics for For-Computer Science**

File: 110.2

Last approved: 04/28/14 4:00 am

Last edit: 11/21/17 2:35 pm

Changes proposed by: tauritzd

Programs

referencing this
course

[AP MATH-BS: Applied Mathematics BS](#)

[CMP SC-BS: Computer Science BS](#)

[CP ENG-BS: Computer Engineering BS](#)

Other Courses

referencing this
course

In The Prerequisites:

[COMP SCI 2200 : Theory of Computer Science](#)

[COMP SCI 2500 : Algorithms](#)

[COMP SCI 2889 : Introduction To Computer Organization And Assembly](#)

[COMP SCI 3800 : Introduction To Operating Systems](#)

[COMP SCI 5300 : Database Systems](#)

[MATH 5107 : Combinatorics And Graph Theory](#)

[PHILOS 3254 : Symbolic Logic in Argumentation](#)

In Workflow

1. **RCOMPSCI Chair**
2. **CCC Secretary**
3. **Engineering DSCC Chair**
4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. CAT entry
11. Peoplesoft

Approval Path

1. 11/08/17 5:37 pm
George Markowsky (markowskyg):
Approved for RCOMPSCI Chair
2. 11/09/17 9:33 am
Brittany Parnell

Requested **Fall 2018** ~~01/13/2015~~

Effective Change

Date

Department

Computer Science

Discipline

Computer Science (COMP SCI)

Course Number 1200

Title

(ershenb):

Approved for CCC
Secretary

3. 11/21/17 9:55 am

sraper: Approved
for Engineering
DSCC Chair

4. 11/21/17 3:26 pm

Brittany Parnell

(ershenb):

Approved for

Pending CCC

Agenda post

History

1. Apr 28, 2014 by

lahne (110.1)

Discrete Mathematics **for** ~~For~~ Computer Science

Abbreviated Discrete Math For Cmp Sc

Course Title

Catalog

Description

A rigorous treatment of topics from discrete mathematics which are essential to computer science. Principal topics include: formal logic (propositional & predicate), proof techniques, mathematical induction, program correctness, sets, combinatorics, probability, relations, functions, matrices, graph theory and graph algorithms.

Prerequisites

A **grade of "C"** or better ~~grade~~ in **both** Comp Sci **1570** and one of **Math 1120, Math 1140, Math 1208, and Math 1214.** ~~1570.~~

Field Trip
Statement

Credit Hours Total: 3	LEC: 3	LAB: 0	IND: 0	RSD: 0
Required for Majors	Yes			
Elective for Majors	No			

Justification for
change:

Lack of algebra skills and mathematical maturity is impeding student success in this course. The added math prereq addresses this impediment.

Semesters
previously
offered as an
experimental
course

Co-Listed
Courses:

Course Reviewer
Comments

Course Change Request

Date Submitted: 12/12/17 5:26 pm

Viewing: **ECON 6440 5440-: Advanced Environmental And Natural Resource Economics**

File: 774.1

Last edit: 12/13/17 9:52 am

Changes proposed by: marcys

Requested **Fall 2018 08/01/2014**

Effective Change

Date

Department

Economics

Discipline

Economics (ECON)

Course Number **6440 5440**

Title

In Workflow

1. **RECONOMI Chair**
2. **CCC Secretary**
3. **Social Sciences DSCC Chair**
4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. CAT entry
11. Peoplesoft

Approval Path

1. 12/13/17 9:13 am Gregory Gelles (gelles):
Approved for RECONOMI Chair
2. 12/13/17 9:52 am Brittany Parnell (ershenb):

Approved for CCC
Secretary
3. 12/15/17 2:59 pm
Barry Flachsbart
(barryf):
Approved for
Social Sciences
DSCC Chair
4. 12/15/17 3:07 pm
Brittany Parnell
(ershenb):
Approved for
Pending CCC
Agenda post

Advanced Environmental And Natural Resource Economics

Abbreviated Adv **Env and Nat Res**

Course Title ~~Env&Nat Resource~~-Eco

Catalog

Description

~~Optimum use of replenishable and non-replenishable resources, public goods and common resources, externalities, private vs.~~**Optimum use of renewable public costs,** and **non-renewable resources, public goods and common resources, externalities, and** quality of ~~of~~ the environment; emphasis on public policy related to environmental **and and** natural resource economics. ~~As This course is an~~ advanced version of Econ 4440, ~~it and~~ will include additional research ~~and project~~ assignments. Credit ~~can't cannot~~ be **earned obtained** for both Econ 4440 and **6440.**
~~Econ 5440.~~

Prerequisites

Econ 2100.

Field Trip

Statement

Credit Hours LEC: 3 LAB: 0 IND: 0 RSD: 0

Total: 3

Required for
Majors **No**

Elective for
Majors **No**

Justification for
change:

This is a graduate level course and should have a 6000 graduate level number.

Semesters
previously
offered as an
experimental
course

Co-Listed

Courses:

Course Reviewer

Comments

ershenb (12/13/17 9:52 am): updated effective date to Fall 2018

Key: 774

[Preview Bridge](#)

Course Change Request

Date Submitted: 12/13/17 9:05 am

Viewing: **ECON 6540** ~~5540~~: **Advanced**

Energy Economics

File: 1737.1

Last edit: 12/13/17 10:05 am

Changes proposed by: marcys

Requested **Fall 2018 08/01/2014**

Effective Change

Date

Department

Economics

Discipline

Economics (ECON)

Course Number **6540** ~~5540~~

Title

In Workflow

1. **RECONOMI Chair**

2. **CCC Secretary**

3. **Social Sciences**

DSCC Chair

4. **Pending CCC**

Agenda post

5. **CCC Meeting**

Agenda

6. Campus Curricula

Committee Chair

7. FS Meeting

Agenda

8. Faculty Senate

Chair

9. Registrar

10. CAT entry

11. Peoplesoft

Approval Path

1. 12/13/17 9:14 am

Gregory Gelles

(gelles):

Approved for

RECONOMI Chair

2. 12/13/17 10:05

am

Brittany Parnell

- (ershenb):
Approved for CCC
Secretary
- 3. 12/15/17 3:00 pm
Barry Flachsbart
(barryf):
Approved for
Social Sciences
DSCC Chair
- 4. 12/15/17 3:12 pm
Brittany Parnell
(ershenb):
Approved for
Pending CCC
Agenda post

Advanced Energy Economics

Abbreviated Adv Energy Economics

Course Title

Catalog

Description

Market structures. World resource development. Supply and demand analysis on energy production and consumption within domestic and global settings. This course is an advanced version of Econ **4540, 345**, and will include additional research and project assignments. Credit cannot be obtained for both Econ **4540 345** and Econ **6540. 445**.

Prerequisites

Econ **2100. 221**.

Field Trip

Statement

Credit Hours LEC: 3 LAB: 0 IND: 0 RSD: 0

Total: 3

Required for
Majors

No

Elective for
Majors

No

Justification for
change:

This is a graduate level course and should have a 6000 graduate level number.

Semesters
previously
offered as an
experimental
course

Co-Listed

Courses:

Course Reviewer

Comments

ershenb (12/13/17 10:05 am): updated effective date to Fall 2018

Key: 1737

[Preview Bridge](#)

Course Change Request

New Course Proposal

Date Submitted: 11/30/17 7:50 am

Viewing: **FINANCE 5310 : Financial Modeling**

File: 4499

Last edit: 12/05/17 12:11 pm

Changes proposed by: barryf

Requested Fall 2018

Effective Change

Date

Department Business and Information Technology

Discipline Finance (FINANCE)

Course Number 5310

Title

In Workflow

1. **RBUSADMN
Chair**
2. **CCC Secretary**
3. **Social Sciences
DSCC Chair**
4. **Pending CCC
Agenda post**
5. **CCC Meeting
Agenda**
6. Campus Curricula
Committee Chair
7. FS Meeting
Agenda
8. Faculty Senate
Chair
9. Registrar
10. CAT entry
11. Peoplesoft

Approval Path

1. 11/30/17 7:28 pm
siauk: Approved
for RBUSADMN
Chair
2. 12/04/17 3:31 pm
Brittany Parnell
(ershenb):
Approved for CCC

Secretary

3. 12/05/17 12:10

pm

Brittany Parnell

(ershenb):

Approved for

Social Sciences

DSCC Chair

4. 12/07/17 9:23 am

Brittany Parnell

(ershenb):

Approved for

Pending CCC

Agenda post

Financial Modeling

Abbreviated Financial Modeling
Course Title

Catalog

Description

This course is built on finance theory, financial analysis, and quantitative methods from prerequisite courses. The course will extensively use Excel spreadsheets to design and construct integrated financial models. The objective is to offer students opportunities to experience hands-on numerical analyses, company valuation, and dynamic projections.

Prerequisites

Finance 2150 or Graduate Standing.

Field Trip

Statement

Credit Hours LEC: 3 LAB: 0 IND: 0 RSD: 0

Total: 3

Required for No

Majors

Elective for Yes

Majors

Justification for new course:

In today's technology-driven market, computer skills play a key role in a student's career success. In most finance courses, students are introduced to fundamental finance theories. Financial modeling is a course that bridges the gap between textbook learning and digitalized practice. The course will prepare students to design and implement realistic forecasting models using Excel spreadsheet functions. The proposed course will be a dual listed course for both undergraduate and graduate students. It will be the first computer-based finance class that takes students step-by-step through financial models that are closely related to other undergraduate and graduate finance courses. The course provides the technology component to the existing paper-based finance courses. This new course diversifies the department course offering and provides students with a more broad exposure in the subject of finance. It will complement the department mission with the technological emphasis.

Part of the Minor in Financial Technology.

Semesters

previously
offered as an
experimental
course

Co-Listed

Courses:

Course Reviewer

Comments

ershenb (12/05/17 12:11 pm): Approved the course form per the request of Dr. Flachsbart (technical issues).

Course Change Request

Date Submitted: 12/13/17 1:45 pm

Viewing: **IS&T 4335 : Fundamentals of Mobile Technology for Business**

File: 2391.6

Last approved: 06/30/14 3:55 am

Last edit: 12/13/17 1:45 pm

Changes proposed by: barryf

Programs

referencing this

course

[CYBERMG-MI: Cybersecurity Management and Information Assurance Minor](#)

[E&S COM-MI: Elect & Social Commerce Minor](#)

[ENTPRNS-MI: Entrepreneurship Minor](#)

[MOBLB&T-MI: Mobile Bus & Tech Minor](#)

Requested **Fall 2018 08/01/2014**

Effective Change

Date

Department

Business and Information Technology

Discipline

Info Science & Technology (IS&T)

Course Number 4335

Title

In Workflow

1. RINFSCTE Chair

2. CCC Secretary

3. Social Sciences

DSCC Chair

4. Pending CCC

Agenda post

5. CCC Meeting

Agenda

6. Campus Curricula

Committee Chair

7. FS Meeting

Agenda

8. Faculty Senate

Chair

9. Registrar

10. CAT entry

11. Peoplesoft

Approval Path

1. 12/13/17 10:20

pm

siauk: Approved

for RINFSCTE

Chair

2. 12/14/17 9:30 am

Brittany Parnell

(ershenb):

Approved for CCC
Secretary

3. 12/15/17 3:00 pm

Barry Flachsbart

(barryf):

Approved for

Social Sciences

DSCC Chair

4. 12/15/17 3:26 pm

Brittany Parnell

(ershenb):

Approved for

Pending CCC

Agenda post

History

1. Apr 28, 2014 by

barryf (2391.1)

2. Jun 30, 2014 by

lahne (2391.5)

Fundamentals of Mobile Technology for Business

Abbreviated Fund MobileTech for Bus

Course Title

Catalog

Description

A broad overview of mobile technology use in business environments. Topics include the mobile industry; mobile network and wireless standards; mobile devices; mobile web design and app development; social and user experience issues; mobile marketing and commerce.

Prerequisites

~~IS&T 3333.~~

Field Trip
Statement

Credit Hours	LEC: 3	LAB: 0	IND: 0	RSD: 0
Total: 3				
Required for Majors	No			
Elective for Majors	No			

Justification for
change:

Instructor has changed course slightly and prerequisite is no longer needed.

Semesters
previously
offered as an
experimental
course

Co-Listed
Courses:

Course Reviewer
Comments

Course Change Request

Date Submitted: 12/13/17 1:45 pm

Viewing: **IS&T 6335 : Mobile Technology for Business**

File: 1871.6

Last approved: 06/30/14 3:55 am

Last edit: 12/14/17 4:30 pm

Changes proposed by: barryf

In Workflow

1. RINFSCTE Chair
2. CCC Secretary
3. Social Sciences DSCC Chair
4. Pending CCC Agenda post
5. CCC Meeting

Agenda

6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. CAT entry
11. Peoplesoft

Catalog Pages
referencing this
course

[Business Administration](#)

[Information Science and Technology](#)

Requested **Fall 2018 08/01/2014**

Effective Change

Date

Department

Business and Information Technology

Discipline

Info Science & Technology (IS&T)

Course Number 6335

Title

Approval Path

1. 12/13/17 10:20 pm
siauk: Approved for RINFSCTE Chair
2. 12/14/17 4:31 pm
Brittany Parnell (ershenb):

Approved for CCC
Secretary

3. 12/15/17 3:00 pm

Barry Flachsbart
(barryf):

Approved for
Social Sciences
DSCC Chair

4. 12/15/17 3:32 pm

Brittany Parnell
(ershenb):

Approved for
Pending CCC
Agenda post

History

1. May 2, 2014 by

barryf (1871.1)

2. Jun 30, 2014 by

lahne (1871.4)

Mobile Technology for Business

Abbreviated **Mobile Tech for Business**

Course Title

Catalog

Description

Overview of mobile technology use in business environments. Topics include: mobile industry; mobile network and wireless standards; mobile devices; mobile web design and app development; social and user experience issues; mobile marketing and commerce. Project required.

Prerequisites

~~IS&T 3333 or equivalent.~~

Field Trip
Statement

Credit Hours LEC: 3 LAB: 0 IND: 0 RSD: 0
Total: 3

Required for
Majors No

Elective for
Majors No

Justification for
change:

Instructor has changed the course slightly and prerequisite is no longer needed.

Semesters
previously
offered as an
experimental
course

Co-Listed
Courses:

Course Reviewer
Comments

Course Change Request

Date Submitted: 11/20/17 3:33 pm

Viewing: **PSYCH 5010 : Seminar for**
~~Introduction to Industrial /~~
Organizational Psychology

File: 2342.7

Last approved: 05/08/17 3:15 am

Last edit: 11/21/17 3:19 pm

Changes proposed by: weidnern

In Workflow

1. RPSYCHOL Chair
2. CCC Secretary
3. Social Sciences
DSCC Chair
4. Pending CCC
Agenda post
5. CCC Meeting
Agenda

Catalog Pages
referencing this
course

[Psychology](#)

Other Courses
referencing this
course

In The Prerequisites:

[PSYCH 6602 : Job Attitudes, Emotions, and Discretionary
Behaviors](#)

[PSYCH 6610 : Leadership, Motivation, and Culture](#)

6. Campus Curricula
Committee Chair
7. FS Meeting
Agenda
8. Faculty Senate
Chair
9. Registrar
10. CAT entry
11. Peoplesoft

Approval Path

1. 11/20/17 2:52 pm
Kristy Giacomelli
(kristyg): Rollback
to Initiator
2. 11/20/17 4:07 pm
murray:
Approved for
RPSYCHOL Chair

Requested Fall **2018** ~~2017~~

Effective Change

Date

Department

Psychological Science
Discipline
Psychology (PSYCH)
Course Number 5010
Title

3. 11/21/17 8:41 am
Brittany Parnell
(ershenb):
Approved for CCC
Secretary
4. 11/21/17 9:10 am
Barry Flachsbart
(barryf):
Approved for
Social Sciences
DSCC Chair
5. 11/21/17 3:27 pm
Brittany Parnell
(ershenb):
Approved for
Pending CCC
Agenda post

History

1. Jan 13, 2017 by
weidnern
(2342.1)
2. May 8, 2017 by
weidnern
(2342.5)

Seminar for ~~Introduction to~~ Industrial / Organizational Psychology

Abbreviated **Ind Org Psych Seminar** ~~Intro~~
Course Title ~~I/O Psychology~~

Catalog
Description

A seminar course for general overviews ~~Review~~ of the most recent ~~theoretical and applied~~ research in **Industrial-Organizational Psychology**. ~~advanced personnel and organizational psychology. Topics will include personnel selection, training and performance appraisal, job attitudes, motivation, work groups and teams, leadership, organizational culture, and organizational development.~~

Prerequisites

Graduate standing.

Field Trip

Statement

Credit Hours LEC: **0** ~~3~~ LAB: 0 IND: 0 RSD: **3** ~~0~~

Total: 3

Required for **No** ~~Yes~~

Majors

Elective for **Yes** ~~No~~

Majors

Justification for

change:

This is designed to return 5010 to a seminar course. This course will remain on the books, but will not be offered yet under the new curriculum. We just want to have the number remain available. A new course "Psych 5020" will be proposed and inserted into the curriculum for Fall 2018 in place of this 5010 course.

Semesters

previously

offered as an

experimental

course

Co-Listed

Courses:

Course Reviewer

Comments

kristyg (11/20/17 2:52 pm): Rollback: Rollback per Dr. Murray.

Key: 2342

[Preview Bridge](#)

Course Change Request

New Course Proposal

Date Submitted: 11/20/17 3:39 pm

Viewing: **PSYCH 5020 : Introduction to Industrial-Organizational Psychology**

File: 4500

Last edit: 11/21/17 9:54 am

Changes proposed by: weidnern

Programs
referencing this
course

[INORGPS-MS: Industrial Organizational Psychology MS](#)

Requested	Fall 2018
Effective Change Date	
Department	Psychological Science
Discipline	Psychology (PSYCH)
Course Number	5020
Title	

In Workflow

1. **RPSYCHOL Chair**
2. **CCC Secretary**
3. **Social Sciences DSCC Chair**
4. **Pending CCC Agenda post**
5. CCC Meeting Agenda
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. CAT entry
11. Peoplesoft

Approval Path

1. 11/20/17 4:08 pm
murray: Approved for RPSYCHOL Chair
2. 11/21/17 9:55 am
Brittany Parnell (ershenb):
Approved for CCC Secretary

3. 11/22/17 9:19 pm

Barry Flachsbart

(barryf):

Approved for

Social Sciences

DSCC Chair

Introduction to Industrial-Organizational Psychology

Abbreviated Intro to Ind Org Psych

Course Title

Catalog

Description

Review of the most recent theoretical and applied research in advanced personnel and organizational psychology. Topics will include personnel selection, training and performance appraisal, job attitudes, motivation, work groups and teams, leadership, organizational culture, and organizational development.

Prerequisites

Graduate Standing

Field Trip

Statement

Credit Hours	LEC: 3	LAB: 0	IND: 0	RSD: 0
--------------	--------	--------	--------	--------

Total: 3

Required for Yes

Majors

Elective for No

Majors

Justification for

new course:

We have been asked to change the course number from 5010 to a number that is more appropriate since the course numbers ending in 10 are generally reserved for

Seminar courses.

Since a number change would kill the 5010 number, we are instead creating a Psych 5020 course which will take the place of the old 5010 in our curriculum. We felt 5020 would be a sufficient and appropriate number to use as this is still an introductory level course for our I-O MS program. If there is a reason that number won't work either, we are open to other suggestions.

Semesters

previously
offered as an
experimental
course

This will be taking the place of Psych 5010 which has been offered in the Fall semester for 4 years now.

Enrollment- FS14: 6, FS15: 12, FS16: 12, FS17: 15

Co-Listed

Courses:

Course Reviewer

Comments

Key: 4500

[Preview Bridge](#)

Course Change Request

Date Submitted: 10/10/17 11:26 am

Viewing: **SYS ENG 6110 : Risk Modeling and Optimization under Uncertainty**
~~Function-Based Risk Analysis~~

File: 719.1

Last edit: 12/21/17 8:40 am

Changes proposed by: qinr

In Workflow

1. **RENGMNGT**
Chair
2. **CCC Secretary**
3. **Engineering DSCC**
Chair
4. **Pending CCC**
Agenda post

Catalog Pages
referencing this
course

[Engineering Management](#)

5. **CCC Meeting**
Agenda

6. Campus Curricula
Committee Chair
7. FS Meeting
Agenda

Requested **Fall 2018 08/01/2014**

Effective Change

Date

Department

Engineering Management and Systems Engineering

Discipline

Systems Engineering (SYS ENG)

Course Number 6110

Title

8. Faculty Senate
Chair
9. Registrar
10. CAT entry
11. Peoplesoft

Approval Path

1. 10/04/17 9:53 am
Suzanna Long
(longsuz):
Approved for
RENGMNGT Chair
2. 10/09/17 11:34
am

- Brittany Parnell
(ershenb):
Rollback to
Initiator
3. 10/10/17 11:28
am
Suzanna Long
(longsuz):
Approved for
RENGMNGT Chair
4. 10/12/17 11:40
am
Brittany Parnell
(ershenb):
Approved for CCC
Secretary
5. 11/21/17 9:58 am
sraper: Approved
for Engineering
DSCC Chair
6. 11/21/17 3:27 pm
Brittany Parnell
(ershenb):
Approved for
Pending CCC
Agenda post

Risk Modeling and Optimization under Uncertainty ~~Function-Based Risk~~

~~Analysis~~

Abbreviated	Rsk Mod and Opt Uncert
Course Title	Function-Based Risk Analysis
Catalog	
Description	

Risk analysis of products and systems will be **explored**. ~~explored using product functionality as the starting point.~~ Traditional probabilistic risk assessment techniques will be covered along with recent approaches (**i.e., stochastic programming, robust optimization, and dynamic programming**) that use historical data **based risk models** to **realize optimal risk management**. ~~produce automatic risk assessments.~~

Prerequisites

Graduate standing.

Field Trip

Statement

Credit Hours LEC: 3 LAB: 0 IND: 0 RSD: 0

Total: 3

Required for No

Majors

Elective for **Yes** ~~No~~

Majors

Justification for

change:

Change the course name to be in-line with the advancement of methodology and the growth of relevant engineering applications.

Co-list it with Engineering Management to allow more students to take and include it in their graduate study plan.

Semesters

previously

offered as an

experimental

course

Co-Listed

Courses:

ENG MGT 6415 - Course Not Found

Course Reviewer

Comments

ershenb (10/09/17 11:34 am): Rollback: Please adjust co-list: ENG MGT 6414 is an existing course.

sraper (11/13/17 10:04 am): checked elective for majors and changed abbreviated title.

Key: 719

[Preview Bridge](#)

Program Change Request

Date Submitted: 09/28/17 4:31 pm

Viewing: **ARC ENG-BS : Architectural**

Engineering BS

File: 143.20

Last approved: 09/15/16 2:40 pm

Last edit: 11/13/17 9:56 am

Changes proposed by: baur

Catalog Pages Using
this Program

[Architectural Engineering](#)

Start Term	Fall 2018 08/22/2016
Program Code	ARC ENG-BS
Department	Civil, Architectural, and Environmental Engineering
Title	

In Workflow

1. **RCIVILEN Chair**
2. **CCC Secretary**
3. **Engineering DSCC Chair**
4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. Kristy Giacomelli

Approval Path

1. 10/03/17 5:04 am
Joel Burken
(burken): Approved
for RCIVILEN Chair
2. 10/04/17 9:52 am
Brittany Parnell
(ershenb):
Approved for CCC
Secretary
3. 11/21/17 9:53 am
srafer: Approved
for Engineering
DSCC Chair
4. 11/21/17 3:25 pm
Brittany Parnell
(ershenb):
Approved for
Pending CCC

Agenda post

History

1. Sep 27, 2013 by
Lahne Black (lahne)
2. Sep 27, 2013 by
Lahne Black (lahne)
3. Apr 28, 2014 by
Lahne Black (lahne)
4. Aug 4, 2014 by
pantaleoa
5. Jan 30, 2015 by
Stuart Baur (baur)
6. Sep 21, 2015 by
Stuart Baur (baur)
7. Sep 15, 2016 by
Crystal Wilson
(wilsoncry)

Architectural Engineering BS

Program Requirements and Description

Architectural Engineering Bachelor of Science

Entering freshmen desiring to study Architectural Engineering will be admitted to the Freshman Engineering Program. They will, however, be permitted, if they wish, to state a Architectural Engineering preference, which will be used as a consideration for available freshman departmental scholarships. The focus of the Freshman Engineering program is on enhanced advising and career counseling, with the goal of providing to the student the information necessary to make an informed decision regarding the choice of a major.

For the Bachelor of Science degree in Architectural Engineering a minimum of 129 credit hours is required. These requirements are in addition to credit received for algebra, trigonometry, and basic ROTC courses. An average of at least two grade points per credit hour must be attained. An average of at least two grade points per credit hour must also be maintained in all courses taken in Architectural Engineering.

Each student's program of study must contain a minimum of 21 credit hours of course work in general education and must be chosen according to the following rules:

All students are required to take one American history course, one economics course, one humanities course,

and [ENGLISH 1120](#). The history course is to be selected from [HISTORY 1200](#) (preferred), [HISTORY 1300](#), or [HISTORY 1310](#). The economics course may be either [ECON 1100](#) or [ECON 1200](#). Art 3203 is **required**. ~~required and fulfills the ABET humanities requirement.~~

Depth requirement. Three credit hours must be taken in humanities or social sciences at the 2000-level or above. This will be satisfied by taking the required History 2510 and 3550. All courses taken to satisfy the depth requirement must be taken after graduating from high school.

The Gen Ed **course chosen must meet requirements as specified under "Engineering Degree Requirements" published** ~~course is to be chosen from the list of approved humanities/social sciences courses and may include one communications course~~ **in the current undergraduate catalog and may include one communications course in** addition to [ENGLISH 1120](#).

Special topics and special problems and honors seminars are allowed only by petition to and approval by the student's department chair.

The Architectural Engineering program at Missouri S&T is characterized by its focus on the scientific basics of engineering and its innovative application; indeed, the underlying theme of this educational program is the application of the scientific basics to engineering practice through attention to problems and needs of the public. The necessary interrelations among the various topics, the engineering disciplines, and the other professions as they naturally come together in the solution of real world problems are emphasized as research, analysis, synthesis, and design are presented and discussed through classroom and laboratory instruction.

Freshman Year

First Semester	Credits	Second Semester	Credits
CHEM 1100	1	MATH 1215	4
FR ENG 11002	1	General Ed Elective1	3
MATH 1214	4	MECH ENG 1720	3
ENGLISH 1120	3	PHYSICS 1135	4
General Ed Elective1	3		
CHEM 1310	5		
& CHEM 1319			
	17		14

Sophomore Year

First Semester	Credits	Second Semester	Credits
CIV ENG 22002	3	STAT 3113	3
MATH 2222	4	CIV ENG 22102	3
PHYSICS 2135	4	CIV ENG 2211	1
CIV ENG 24012	3	ARCH ENG 2103	3
ARCH ENG 2003	3	ART 3203	3
		MATH 3304	3
		MECH ENG 2350	2
	17		18

Junior Year

First Semester	Credits	Second Semester	Credits
----------------	---------	-----------------	---------

<u>ARCH ENG 32012</u>	3	<u>ARCH ENG 3805</u>	3
<u>CIV ENG 33302</u>	3	<u>ARCH ENG 5872</u>	3
<u>MECH ENG 2527</u>	3	<u>ARCH ENG 48202</u>	3
<u>ARCH ENG 3803</u>	3	<u>ARCH ENG 48002</u>	3
<u>ARCH ENG 3804</u>	3	<u>CIV ENG 3116</u>	3
<u>ENG MGT 1210</u>	2	<u>HISTORY 2510</u>	3
<u>CIV ENG 3715</u>	3	<u>ARCH ENG 3220</u>	3
	17		15

Senior Year

First Semester	Credits	Second Semester	Credits
<u>ARCH ENG 4010</u>	1	<u>ARCH ENG 4097</u>	3
<u>ARCH ENG 3210</u>	3	ARCH ENG Technical Elective	3,4,3
<u>ARCH ENG 4448</u>	3	<u>CIV ENG 4729</u>	3
ARCH ENG Technical Elective	3,4,3	General Education Elective	1
<u>HISTORY 4550</u>	3	Basic Science Elective	5
<u>ENG MGT 1210</u>	2		
<u>ARCH ENG 4850</u>	3		
	16		15

Total Credits: 129

1All general education electives must be approved by the student's advisor. Students must comply with the general education requirements with respect to selection and depth of study. These requirements are specified in the current catalog.

2A grade of 'C' or better required to satisfy graduation requirements.

3A grade of 'C' or better may be required in ARCH ENG technical elective prerequisite courses. Refer to the Missouri S&T undergraduate catalog for this prerequisite information.

4Choose technical electives from approved lists under Emphasis Areas for Architectural Engineering Students.

A maximum of 3 credits of independent study (ARCH ENG 5000 or ARCH ENG 4099) may be used as a technical elective. Additional independent study course may be taken but will not count towards the B.S.

Architectural Engineering degree.

5Each student is required to take three hours of basic science electives in consultation with his/her academic advisor. This course must be selected from the following: Chem 1301, Geo 1111, Geo 2610, Bio Sci 1213, Bio Sci 1943, Phys 1505, or Phys 2305

Note: All Architectural Engineering students must take the Fundamentals of Engineering examination prior to graduation. A passing grade on this examination is not required to earn a B.S. degree, however, it is the first step toward becoming a registered professional engineer. This requirement is part of the Missouri S&T assessment process as described in Assessment Requirements found elsewhere in this catalog.

~~Students must sign a release form giving the University~~

~~access to their Fundamentals of Engineering Examination score.~~ Emphasis Areas and Course Listings by Area for Architectural Engineering Students

Area I, Structural Engineering

ARCH ENG 5001	Special Topics	6
ARCH ENG 5203	Applied Mechanics In Structural Engineering	3
ARCH ENG 5205	Structural Analysis II	3
ARCH ENG 5260	Analysis And Design Of Wood Structures	3
ARCH ENG 5207	Computer Methods of Structural Analysis	3
ARCH ENG 5210	Advanced Steel Structures Design	3
ARCH ENG 5220	Advanced Concrete Structures Design	3
ARCH ENG 5222	Prestressed Concrete Design	3
ARCH ENG 5729	Foundation Engineering II	3
ARCH ENG 5231	Infrastructure Strengthening with Composites	3
ARCH ENG 5206	Low-Rise Building Analysis And Design	3
ARCH ENG 5208	Structural Dynamics	3

Area II, Construction Engineering and Project Management

ARCH ENG 5442	Construction Planning and Scheduling Strategies	3
ARCH ENG 5445	Construction Methods	3
ARCH ENG 5446	Management Of Construction Costs	3
ARCH ENG 5448	Green Engineering: Analysis of Constructed Facilities	3
ARCH ENG 5449	Engineering and Construction Contract Specifications	3
ENG MGT 5110	Managerial Decision Making	3
ENG MGT 5613	Value Analysis	3
ENG MGT 5711	Total Quality Management	3

Area III, Environmental Systems for Buildings

ARCH ENG 5001	Special Topics	0-6
ARCH ENG 5642	Sustainability, Population, Energy, Water, and Materials	3
ARCH ENG 5665	Indoor Air Pollution	3
ARCH ENG 5850	Residential Renewable Energy Systems	3
ENG MGT 5513	Energy and Sustainability Management Engineering	3

Mechanical Emphasis Courses

MECH ENG 5309	Engineering Acoustics I	3
MECH ENG 5566	Solar Energy Technology	3
MECH ENG 5575	Mechanical Systems For Environmental Control	3

Electrical Emphasis Courses

ELEC ENG 3340	Basic Programmable Logic Controllers	3
ELEC ENG 5150	Photovoltaic Systems Engineering	3
COMP ENG 2210 & COMP ENG 2211	Introduction to Digital Logic and Computer Engineering Laboratory	4

Area IV, Construction Materials

ARCH ENG 5203	Applied Mechanics In Structural Engineering	3
CIV ENG 5113	Composition And Properties Of Concrete	3
CIV ENG 5118	Smart Materials And Sensors	3
CIV ENG 5156	Concrete Pavement Design	3
CER ENG 5810	Principles Of Engineering Materials	3

Architectural Engineering Courses

ARCH ENG 2103	Architectural Materials And Methods Of Construction	3
ARCH ENG 3804	Architectural Design II	3
ARCH ENG 3805	Course ARCH ENG 3805 Not Found	3
ART 3203	Architectural Design I	3
ARCH ENG 4820	Building Lighting Systems	3

Architectural Engineering Courses (cross-list with existing civil engineering courses)

ARCH ENG 2003	Engineering Communications and Computations	3
ARCH ENG 2001	Special Topics	0-6
ARCH ENG 3000	Special Problems	1-6
ARCH ENG 3001	Special Topics	0-6
ARCH ENG 2002	Cooperative Engineering Training	1
ARCH ENG 4010	Senior Seminar: Engineering In A Global Society	1
ARCH ENG 3201	Structural Analysis I	3
ARCH ENG 3210	Structural Design in Metals	3
ARCH ENG 3220	Reinforced Concrete Design	3
ARCH ENG 4447	Ethical, Legal and Professional Engineering Practice	2
ARCH ENG 4448	Fundamentals Of Contracts And Construction Engineering	3
ARCH ENG 4097	Senior Design Project	3
ARCH ENG 5000	Special Problems	6
ARCH ENG 5001	Special Topics	6
ARCH ENG 5205	Structural Analysis II	3
ARCH ENG 5260	Analysis And Design Of Wood Structures	3
ARCH ENG 5207	Computer Methods of Structural Analysis	3
ARCH ENG 5210	Advanced Steel Structures Design	3
ARCH ENG 5220	Advanced Concrete Structures Design	3
ARCH ENG 5222	Prestressed Concrete Design	3
ARCH ENG 5445	Construction Methods	3

<u>ARCH ENG 5446</u>	Management Of Construction Costs	3
<u>ARCH ENG 5449</u>	Engineering and Construction Contract Specifications	3
<u>ARCH ENG 5231</u>	Infrastructure Strengthening with Composites	3
<u>ARCH ENG 4099</u>	Undergraduate Research	6

Civil Engineering Courses (required courses, emphasis area, and/or technical electives)

<u>CIV ENG 3715</u>	Fundamentals of Geotechnical Engineering	3
<u>CIV ENG 3116</u>	Construction Materials, Properties And Testing	3
<u>CIV ENG 4729</u>	Foundation Engineering	3
<u>CIV ENG 3330</u>	Engineering Fluid Mechanics	3
<u>CIV ENG 5113</u>	Composition And Properties Of Concrete	3
<u>CIV ENG 5117</u>	Asphalt Pavement Design	3
<u>CIV ENG 5729</u>	Foundation Engineering II	3
<u>CIV ENG 5441</u>	Professional Aspects Of Engineering Practice	3
<u>CIV ENG 5445</u>	Construction Methods	3
<u>CIV ENG 5446</u>	Management Of Construction Costs	3
<u>CIV ENG 5449</u>	Engineering and Construction Contract Specifications	3

Justification for
request

Supporting
Documents

Course Reviewer

Comments

sraper (11/10/17 9:02 am): Changed language as related to the old "Approved List" and deleted sentence about signing to release FE results.

sraper (11/10/17 9:02 am): added "and" to revised statement.

sraper (11/13/17 9:56 am): edit Gen Ed statement.

Program Change Request

Date Submitted: 11/02/17 2:33 pm

Viewing: **AUTOENG-MI : Minor in Automation Engineering**

File: 230.12

Last approved: 07/20/15 12:25 pm

Last edit: 11/06/17 9:04 am

Changes proposed by: kte

Catalog Pages Using
this Program

[Electrical Engineering](#)

Start Term	Fall 2018 2015
Program Code	AUTOENG-MI
Department	Electrical and Computer Engineering
Title	

In Workflow

1. RELECENG Chair
2. CCC Secretary
3. Engineering DSCC Chair
4. Pending CCC Agenda post
5. CCC Meeting Agenda
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. Kristy Giacomelli

Approval Path

1. 11/04/17 3:56 pm
Daryl Beetner
(daryl): Approved for RELECENG Chair
2. 11/06/17 9:05 am
Brittany Parnell
(ershenb):
Approved for CCC Secretary
3. 11/21/17 9:53 am
sraper: Approved for Engineering DSCC Chair
4. 11/21/17 3:25 pm
Brittany Parnell
(ershenb):
Approved for Pending CCC

Agenda post

History

1. Apr 28, 2014 by Kelvin Erickson (kte)
2. May 7, 2014 by Lahne Black (lahne)
3. Jul 20, 2015 by pantaleoa

Minor in Automation Engineering

Program Requirements and Description

Minor in Automation Engineering

A minor in automation engineering will require the following:

Pass [ELEC ENG 3340](#) Basic Programmable Logic Controllers with a "C" or better

Pass one of the following courses with a "C" or better:

[ELEC ENG 3320](#) Control Systems

[MECH ENG 4479](#) Automatic Control Of Dynamic Systems

[CHEM ENG 4110](#) Chemical Engineering Process Dynamics And Control

Pass 9 additional hours of coursework from the following list. A "C" or better is required for all 9 hours.

[CHEM ENG 5370](#) Intermediate Process Dynamics And Control

[CHEM ENG 5190](#)/[ELEC ENG 5350](#) Plantwide Process Control

[CHEM ENG 4310](#)/[MECH ENG 5644](#) Interdisciplinary Problems In Manufacturing Automation

[ELEC ENG 4380](#) Practicum in Automation Engineering (no more than one can be applied to the Automation Engineering Minor)

[ELEC ENG 5340](#) Advanced PLC

[ELEC ENG 5345](#) PLC Motion Control

[ELEC ENG 5870](#)/[MECH ENG 5478](#) Mechatronics

[MECH ENG 5449](#) Robotic Manipulators and Mechanisms

[MECH ENG 5655](#) Manufacturing Equipment Automation

Justification for
request

Elec Eng 5345 added to the list of additional courses. It is a new automation engineering course and its permanent number was effective with the Spring 2017 semester.

Supporting

Documents

Course Reviewer

Comments

ershenb (11/06/17 9:04 am): updated start term to Fall 2018

Key: 230

Program Change Request

Date Submitted: 08/26/17 2:20 pm

Viewing: **GE ENG-BS : Geological Engineering BS**

File: 156.7

Last approved: 07/20/15 3:09 pm

Last edit: 11/10/17 10:39 am

Changes proposed by: grotekr

Catalog Pages Using
this Program

[Geological Engineering](#)

Start Term	Fall 2018 2015
Program Code	GE ENG-BS
Department	Geosciences and Geological and Petroleum Engineering
Title	

In Workflow

1. **RGEOENG Chair**
2. **CCC Secretary**
3. **Sciences DSCC Chair**
4. **Engineering DSCC Chair**
5. **Pending CCC Agenda post**
6. **CCC Meeting Agenda**
7. Campus Curricula Committee Chair
8. FS Meeting Agenda
9. Faculty Senate Chair
10. Registrar
11. Kristy Giacomelli

Approval Path

1. 08/27/17 9:31 am
David Borrok
(borrokd): Approved for RGEOENG Chair
2. 08/28/17 9:52 am
Brittany Parnell
(ershenb):
Approved for CCC Secretary
3. 09/06/17 1:09 pm
Katie Shannon
(shannonk):
Approved for Sciences DSCC Chair
4. 11/21/17 9:58 am
sraper: Approved for Engineering

DSCC Chair

5. 11/21/17 3:26 pm

Brittany Parnell
(ershenb):

Approved for

Pending CCC

Agenda post

History

1. Mar 18, 2014 by
Lahne Black (lahne)
2. Nov 18, 2014 by
pantaleoa
3. Nov 18, 2014 by
pantaleoa
4. Jul 20, 2015 by
pantaleoa

Geological Engineering BS

Program Requirements and Description

Bachelor of Science

Geological Engineering

Entering freshmen desiring to study geological engineering will be admitted to the Freshman Engineering Program. They will, however, be permitted, if they wish, to state a geological engineering preference, which will be used as a consideration for available freshman departmental scholarships. The focus of the Freshman Engineering program is on enhanced advising and career counseling, with the goal of providing to the student the information necessary to make an informed decision regarding the choice of a major.

For the bachelor of science degree in geological engineering a minimum of 128 credit hours is required. These requirements are in addition to credit received for algebra, trigonometry, and basic ROTC courses. A student must maintain at least two grade points per credit hour for all courses taken in the student's major department, and an average of at least two grade points per credit hour must be maintained in geological engineering.

The geological engineering curriculum contains a required number of hours in humanities and social **sciences**. ~~sciences as specified by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.~~ Each student's program of study must contain a minimum of 18 credit hours of course work

from the humanities and the social sciences areas and should be chosen according to the following rules:

All students are required to take one American history course and one economics course. The history course is to be selected from [HISTORY 1200](#), [HISTORY 1300](#), [HISTORY 1310](#), or [POL SCI 1200](#). The economics course may be either [ECON 1100](#) ~~ECON 1100~~ or [ECON 1200](#). Some disciplines require one humanities course to be **selected** ~~selected from the approved lists~~ for art, English, foreign languages, music, philosophy, speech and media studies, or theater.

Of the remaining hours, six credit hours must be taken in humanities or social sciences at the **1000** ~~100~~-level or above and must **meet requirements as specified under "Engineering Degree Requirements" published in** ~~be selected from the current undergraduate catalog. approved lists.~~ Each of these courses must have as a prerequisite one of the humanities or social sciences courses already taken. Foreign language courses numbered **1180** ~~70 to 80~~ can be considered to be one of these courses. (Students may receive humanities credit for foreign language courses in their native tongue only if the course is at the **3000** ~~300~~-level.)

Some departments list specific requirements; e.g. a psychology course, a literature course, and /or a second semester of economics. Selections should be made to ensure that these requirements are met.

~~Skill courses are not allowed to meet humanities and social sciences requirements except in foreign languages. Students who select the foreign language option are urged to take more than one course.~~ Special topics, special problems courses and honors seminars are allowed only by petition to and approval by the student's program head.

The geological engineering program at Missouri S&T is characterized by its focus on the scientific basics of engineering and its innovative application; indeed, the underlying theme of this educational program is the application of the scientific basics to engineering practice through attention to problems and needs of the public. The necessary interrelations among the various topics, the engineering disciplines, and the other professions as they naturally come together in the solution of real world problems are emphasized as research, analysis, synthesis, and design are presented and discussed through classroom and laboratory instruction.

Freshman Year

First Semester	Credits	Second Semester	Credits
MATH 1214	4	MATH 1215	4
CHEM 1310	4	Chemistry/Geochemistry Electiveb	3
CHEM 1100	1	MECH ENG 1720	3
CHEM 1319	1	PHYSICS 1135	4
ENGLISH 1120	3	H/SS Electivea	3
FR ENG 1100	1		
H/SS Electivea	3		
	17		17

Sophomore Year

First Semester	Credits	Second Semester	Credits
MATH 2222	4	MATH 3304	3
PHYSICS 2135	4	CIV ENG 2200	3
GEO ENG 3148	3	GEO ENG 2110	1
GEO ENG 1150	3	GEOLOGY 2611	3

<u>GEO ENG 1120</u>	4	<u>GEO ENG 3175</u>	3
<u>GEO ENG 1119</u>	1	Humanities/Soc Sci Electivea	3
	15		16
Junior Year			
First Semester	Credits	Second Semester	Credits
<u>MECH ENG 2350</u>	2	<u>CIV ENG 3330</u>	3
<u>CIV ENG 2210</u>	3	<u>GEO ENG 4115</u>	3
<u>GEOLOGY 3310</u>	3	<u>GEO ENG 5443</u>	3
Economics Electivej	3	Technical Communications Electived	3
Hum/Soc Sc Electivea	3	Humanities/Soc. Sci Electivea	3
Earth Energy Electivee	3		
<u>Technical Elective (Technical Electives)g</u>	3		
	17		15
Senior Year			
First Semester	Credits	Second Semester	Credits
Geophysics Electivei	3	<u>GEO ENG 5174</u>	3
<u>GEO ENG 4010</u>	0.5	<u>GEO ENG 4010</u>	0.5
<u>GEO ENG 5331</u>	3	Earth Mechanics Electivee	3
<u>GEO ENG 5441</u>	3	Eng Econ Electivef	3
<u>GEO ENG 5090</u> or <u>5092h</u>	3	Technical Electivesg	6
<u>CIV ENG 3715</u> or <u>MIN ENG 4823</u>	3		
	15.5		15.5

Total Credits: 128

a The sequence of course selection must provide both breadth and depth of content and must meet requirements as specified under "Engineering Degree Requirements" published in the current undergraduate catalog. A total of 18 hours of humanities and social science credit is required.

b The chemistry/geochemistry elective must be selected from chemistry, geochemistry or biology courses as approved by your advisor.

~~e Students should select GEO ENG 5556, or other earth energy electives such as PET ENG 3330, PET ENG 2510, or GEOLOGY 5513.~~

d The Technical Communications elective can be selected from ENGLISH 1160, ENGLISH 3560, SP&M S 1185, or the complete four-course sequence in Advanced ROTC (MIL ARMY 3250, MIL ARMY 3500, MIL ARMY 4250, and MIL ARMY 4500 or AERO ENG 5758, AERO ENG 4790, and AERO ENG 5481).

e To be selected from GEO ENG 5471, GEO ENG 5381, MIN ENG 4823, PET ENG 2510, PET ENG 3520, CIV ENG 3715, CIV ENG 4729, or CIV ENG 5715.

f To be selected from ENG MGT 5210, MIN ENG 3512, or PET ENG 4590 or both ENG MGT 1100 and ENG MGT 1210.

g To be selected from advanced courses in geological, mining, petroleum or civil engineering, geology or other courses with approval of your advisor. Must contain design content and must be approved by your advisor.

h Students may take GEO ENG 5090 or GEO ENG 5092 for senior design credit.

i The Geophysics elective can be selected from [GEO ENG 5736](#), [GEO ENG 5761](#), or [GEO ENG 5782](#).

j The Economics Elective must be selected from Econ 1100 or Econ 1200.

All GE students must take the Fundamentals of Engineering Examination prior to graduation. A passing grade is not required; however, it is the first step toward becoming a registered professional engineer. This requirement is part of the Missouri S&T assessment process.

Students must sign a release form giving the University access to their Fundamentals of Engineering

Examination score. Geological engineering students must earn the grade of "C" or better in all geological engineering courses to receive credit toward graduation. The total number of credit hours required for a degree in Geological Engineering is 128. The assumption is made that a student admitted to the Department has completed 34 hours toward graduation to fulfill the requirements of the Freshman Engineering program.

Geological Engineering Emphasis Areas

Electives are selected by the student with advisor approval. Some appropriate electives are listed for each emphasis area.

Environmental Protection and Hazardous Waste Management

GEO ENG 5235	Environmental Geological Engineering	3
GEO ENG 5237	Geological Aspects Of Hazardous Waste Management	3
GEO ENG 5381	Intermediate Subsurface Hydrology And Contaminant Transport Mechs	3
GEO ENG 5331	Subsurface Hydrology	3
GEO ENG 4115	Statistical Methods in Geology and Engineering	3
GEO ENG 4276	Environmental Aspects Of Mining	3
GEO ENG 5233	Risk Assessment In Environmental Studies	3
CIV ENG 3715	Fundamentals of Geotechnical Engineering	3

Groundwater Hydrology and Contaminant Transport

GEO ENG 5381	Intermediate Subsurface Hydrology And Contaminant Transport Mechs	3
GEO ENG 5233	Risk Assessment In Environmental Studies	3
GEO ENG 5174	Geological Engineering Field Methods	3
GEO ENG 5331	Subsurface Hydrology	3
GEO ENG 4115	Statistical Methods in Geology and Engineering	3
GEO ENG 5441	Engineering Geology And Geotechnics	3
CIV ENG 3715	Fundamentals of Geotechnical Engineering	3
PET ENG 3330	Well Logging	3

Engineering Geology and Geotechnics

GEO ENG 5471	Rock Engineering	3
CIV ENG 3715	Fundamentals of Geotechnical Engineering	3
MIN ENG 4823	Rock Mechanics	3
CIV ENG 4729	Foundation Engineering	3
MIN ENG 308	Course MIN ENG 308 Not Found	

GEO ENG 5146	Applications Of Geographic Information Systems	3
GEO ENG 5441	Engineering Geology And Geotechnics	3
GEO ENG 4115	Statistical Methods in Geology and Engineering	3
Petroleum, Energy and Natural Resources		
PET ENG 3520	Petroleum Reservoir Engineering	3
MIN ENG 4823	Rock Mechanics	3
GEO ENG 5146	Applications Of Geographic Information Systems	3
GEO ENG 5381	Intermediate Subsurface Hydrology And Contaminant Transport Mechs	3
GEOLOGY 5511	Applied Petroleum Geology	3
PET ENG 2510	Properties Of Hydrocarbon Fluids	3
PET ENG 1110	Introduction to Petroleum Engineering	1
PET ENG 3330	Well Logging	3
PET ENG 4520	Well Test Analysis	3
Quarry Engineering		
MIN ENG 4823	Rock Mechanics	3
GEO ENG 5575	Aggregates And Quarrying	3
CIV ENG 3116	Construction Materials, Properties And Testing	3
GEO ENG 5471	Rock Engineering	3
GEO ENG 4276	Environmental Aspects Of Mining	3
MIN ENG 3913	Mineral Identification and Exploration	3
MIN ENG 5612	Principles of Explosives Engineering	3
MIN ENG 308	Course MIN ENG 308 Not Found	3
MIN ENG 5822	Strata Control	3

Justification for request

Two changes are requested:

1. In the fall semester of the sophomore year, Geo Eng 1120 has been changed to Geo Eng 1119. Geo Eng 1120 does not exist. Geo Eng 1119 is the necessary course.
2. In the fall semester of the junior year, the "Earth Energy Elective" has been replaced with "Technical Elective". The Geo Eng faculty have decided that the earth energy requirement is unnecessarily restrictive, and current earth energy courses either require excessive numbers of prerequisites or are not offered with sufficient frequency for students to routinely enroll in these courses.

Supporting Documents

Course Reviewer

Comments

ershenb (08/28/17 9:52 am): updated Start Term to Fall 2018

shannonk (09/06/17 9:45 am): What about the course MIN ENG 308, this course number appears to need updating

shannonk (09/06/17 1:09 pm): MIN ENG 308 Course not found removed after communication with David Borrok, old course number

sraper (09/13/17 4:13 pm): Awaiting answers to questions with regard to H/SS restriction that does not match CEC/Engineering policy, and FE statement.

sraper (11/10/17 9:32 am): various edits related to H/SS list and FE statement.

ershenb (11/10/17 10:39 am): Per the request of Dr. Raper, removed AERO ENG 351 from Footnote D

Key: 156

Program Change Request

Date Submitted: 11/08/17 9:58 am

Viewing: **HCI-MI : Human-Computer Interaction
and User Experience Minor**

File: 238.6

Last approved: 05/16/16 1:36 pm

Last edit: 11/08/17 9:58 am

Changes proposed by: barryf

Catalog Pages Using
this Program

[Information Science and Technology](#)

Start Term	Summer 2018 Fall 2016
Program Code	HCI-MI
Department	Business and Information Technology
Title	

In Workflow

1. RINFSCTE Chair
2. CCC Secretary
3. Social Sciences
DSCC Chair
4. Pending CCC
Agenda post
5. CCC Meeting
Agenda
6. Campus Curricula
Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. Kristy Giacomelli

Approval Path

1. 11/08/17 10:16 pm
siauk: Approved for
RINFSCTE Chair
2. 11/09/17 11:08 am
Brittany Parnell
(ershenb):
Approved for CCC
Secretary
3. 11/09/17 11:23 am
Barry Flachsbart
(barryf): Approved
for Social Sciences
DSCC Chair
4. 11/21/17 3:26 pm
Brittany Parnell
(ershenb):
Approved for
Pending CCC

Agenda post

History

1. Mar 17, 2015 by Barry Flachsbart (barryf)
2. Jul 28, 2015 by kleb6b
3. Jul 29, 2015 by pantaleoa
4. May 16, 2016 by pantaleoa

Human-Computer Interaction and User Experience Minor

Program Requirements and Description

Minor in Human-Computer Interaction and User Experience

The minor in human-computer interaction and user experience requires the following 15 hours of coursework:

<u>PSYCH 1101</u>	General Psychology	3
<u>IS&T 4654</u>	Web and Digital Media Development	3
<u>IS&T 5885</u>	Human-Computer Interaction	3
And two of the following		6
<u>IS&T 4680</u>	Introduction to Web and New Media Studies	
<u>IS&T 5886</u>	Prototyping Human-Computer Interactions	
<u>IS&T 5887</u>	Human-Computer Interaction Evaluation	

Justification for

request

Provide additional flexibility

Supporting

Documents

Course Reviewer

Comments

Key: 238

Program Change Request

Date Submitted: 11/20/17 3:45 pm

Viewing: **INORGPS-MS : Industrial Organizational Psychology MS**

File: 234.20

Last approved: 07/11/17 8:42 am

Last edit: 12/05/17 12:13 pm

Changes proposed by: weidnern

Catalog Pages

Using this

Program

[Psychology](#)

Start Term	Fall 2018 2017
Program Code	INORGPS-MS
Department	Psychological Science
Title	

In Workflow

1. **RPSCYCHOL Chair**
2. **CCC Secretary**
3. **Social Sciences DSCC Chair**
4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**
6. **Campus Curricula Committee Chair**
7. **FS Meeting Agenda**
8. **Faculty Senate Chair**
9. **Registrar**
10. **Kristy Giacomelli**

Approval Path

1. 11/20/17 4:07 pm
murray: Approved for RPSYCHOL Chair
2. 11/22/17 8:59 am
Brittany Parnell (ershenb):
Approved for CCC Secretary
3. 12/05/17 12:12 pm
Brittany Parnell (ershenb):
Approved for Social Sciences DSCC Chair
4. 12/07/17 9:27 am
Brittany Parnell (ershenb):
Approved for Pending CCC Agenda post

History

1. Apr 17, 2014 by
[Lahne Black \(lahne\)](#)
2. Apr 17, 2014 by

- Lahne Black (lahne)
- 3. Apr 24, 2014 by
Lahne Black (lahne)
- 4. Apr 24, 2014 by
Lahne Black (lahne)
- 5. Apr 24, 2014 by
Lahne Black (lahne)
- 6. May 7, 2014 by
Lahne Black (lahne)
- 7. Jul 8, 2014 by
pantaleoa
- 8. Jul 29, 2014 by
pantaleoa
- 9. Jun 19, 2015 by
nstone
- 10. Jun 23, 2015 by
pantaleoa
- 11. Jul 24, 2015 by
pantaleoa
- 12. Jul 24, 2015 by
pantaleoa
- 13. Dec 1, 2016 by
Nathan Weidner
(weidnern)
- 14. Jul 11, 2017 by
Crystal Wilson
(wilsoncry)

Industrial Organizational Psychology MS

Program Requirements and Description

Master of Science in Industrial-Organizational Psychology

Admission Requirements

Students interested in the M.S. in I-O psychology program should review the admissions requirements listed on our website (<http://psych.mst.edu/graduate/indorgpsych/>).

Program Requirements

The M.S. in industrial-organizational psychology requires 40 credit hours which includes a thesis or non-thesis option. Students will complete 24 credit hours of core courses, 10 hours of methods courses, and either 6 hours of elective credits or 6 hours of thesis credits. Applied internship experiences are suggested, but not required as part of the program. The program will take at least 2 years to complete and classes are offered both on-campus and via distance.

Core Courses (24 hours)

PSYCH 5010

Introduction to Industrial / Organizational Psychology

PSYCH 5020	Introduction to Industrial-Organizational Psychology
PSYCH 5601	Small Group Dynamics
PSYCH 5602	Organizational Development
PSYCH 5700	Job Analysis and Performance Management
PSYCH 6610	Leadership, Motivation, and Culture
PSYCH 6702	Personnel Selection
PSYCH 6602	Job Attitudes, Emotions, and Discretionary Behaviors
PSYCH 6700	Training and Development
Methods Courses (10 hours)	
PSYCH 5201	Psychometrics
PSYCH 5210	Advanced Research Methods
PSYCH 5012	Ethics and Professional Responsibilities
PSYCH 5202	Applied Psychological Data Analysis
Electives from list below or Thesis (6 hours)	
PSYCH 5710	Advanced Human Factors
PSYCH 5600	Advanced Social Psychology
PSYCH 5001.001	Advanced Cognitive Psychology
PSYCH 5001.002	Occupational Health and Safety
Students completing a thesis would need to complete the following in place of electives:	
PSYCH 6099	Research

Justification for request

We previously included Psych 5010 which was a seminar course. This has caused problems due to the limitation on seminar courses for MS programs.

To address this issue, we had changed 5010 to a lecture course. That has caused confusion because the XX10 courses are supposed to be reserved for seminars.

To address these issues, we have created a new course 5020 which will take the place of our 5010 seminar. 5010 will revert to a seminar course and will be an elective. 5020 will become a required course and be included in place of 5010. 5010 is being changed to "seminar in I-O Psych" and the new 5020 course is picking up the "Introduction to I-O Psychology" name. We hope to have these changes in place for the Fall 2018 semester.

Supporting

Documents

Course Reviewer

Comments

ershenb (11/21/17 10:13 am): .

barryf (11/22/17 9:34 pm): Fixed Core Courses list. BarryF I think we still need to fix the Methods Courses by listing the credit hours. I think we still need to clarify the Electives or Thesis section by listing the options and credit hours. BarryF

barryf (11/29/17 2:35 pm): Minor wording change in electives box.

ershenb (12/05/17 12:13 pm): Approved course form per the request of Dr. Flachsbart (technical issues).

Key: 234

Program Change Request

Date Submitted: 10/30/17 4:06 pm

Viewing: **PRE LAW-MI : Pre Law Minor**

File: 121.1

Last edit: 11/01/17 9:03 am

Changes proposed by: dewittp

Catalog Pages Using
this Program

[Prelaw](#)

Start Term	Fall 2018
Program Code	PRE LAW-MI
Department	History and Political Science
Title	

In Workflow

- RHISTORY Chair**
- CCC Secretary**
- Arts & Humanities
DSCC Chair**
- Pending CCC
Agenda post**
- CCC Meeting
Agenda**
- Campus Curricula
Committee Chair
- FS Meeting Agenda
- Faculty Senate Chair
- Registrar
- Kristy Giacomelli

Approval Path

- 10/31/17 3:35 pm
sfogg: Approved for
RHISTORY Chair
- 11/01/17 9:04 am
Brittany Parnell
(ershenb):
Approved for CCC
Secretary
- 11/01/17 9:19 am
Petra Dewitt
(dewittp): Approved
for Arts &
Humanities DSCC
Chair
- 11/21/17 3:26 pm
Brittany Parnell
(ershenb):
Approved for

Pending CCC

Agenda post

Pre Law Minor

Program Requirements and Description

Prelaw Minor

To qualify, students must complete a minimum of 18 hours of coursework in the following disciplines.

PHILOS 1115	Introduction To Logic	3
Select two of the following:		6
HISTORY 1300	American History To 1877	
HISTORY 1310	American History Since 1877	
POL SCI 1200	American Government	
PHILOS 1105	Introduction To Philosophy	
Select three of the following:		9
Two of the three courses must come from the humanities and social sciences disciplines of History, English, Etymology, Philosophy, or Political Science.		
ENGLISH 2410	Theory Of Written Communication	
ENGLISH 3101	Advanced Composition	
HISTORY 2510	History of Technology	
HISTORY 2530	Course HISTORY 2530 Not Found	
HISTORY 3530	History of Science	
HISTORY 4470	American Environmental History	
HISTORY 2790	Historiography	
PHILOS 3235	Business Ethics	
PHILOS 4340	Social Ethics	
PHILOS 4345	Philosophy Of Science	
PHILOS 4350	Environmental Ethics	
PHILOS 4360	Foundations Of Political Conflict	
POL SCI 3300	Principles Of Public Policy	
POL SCI 3310	Public Policy Analysis	
POL SCI 3760	The American Presidency	
POL SCI 3763	Contemporary Political Thought	
May Substitute ONE of these three courses with one of the following with the approval of the advisor:		
BUS 1210	Financial Accounting	
BUS 2910	Business Law	
COMP SCI 4700	Intellectual Property For Computer Scientists	
IS&T 5168/PHILOS 4368	Law and Ethics in E-Commerce	

[ECON 3830](#)[POL SCI 2760](#)[ECON 4430](#)[ECON 4820](#)[ENG MGT 5514](#)[ENG MGT 5512](#)[ETYM 4306](#)

History Of Economic Thought

~~Course POL SCI 2760 Not Found~~

Cost-Benefit Analysis

Labor Economics

Patent Law

Legal Environment

Introduction To Etymology

Justification for
request

Add the following courses to the minor to satisfy the requirements for three courses beyond the mandated courses for the degree:

POL SC 225 Comparative Politics

POL SC 226 International Relations

POL SC 237 Contemporary Political Thought

POL SC 290 American Political Parties

POL SC 316 The American Presidency

Supporting
Documents

Course Reviewer
Comments

ershenb (11/01/17 9:03 am): updated Start Term to Fall 2018

Key: 121

Program Change Request

New Program Proposal

Date Submitted: 11/30/17 7:54 am

Viewing: **PROPOSED : Business Applications and Software Development Minor**

File: 255

Last edit: 12/05/17 9:36 am

Changes proposed by: barryf

Start Term	Fall 2018
Program Code	PROPOSED
Department	Business and Information Technology
Title	

In Workflow

1. RINFSCTE Chair
2. CCC Secretary
3. Social Sciences DSCC Chair
4. Pending CCC Agenda post
5. CCC Meeting Agenda
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. Kristy Giacomelli

Approval Path

1. 11/30/17 7:28 pm
siauk: Approved for RINFSCTE Chair
2. 12/04/17 3:32 pm
Brittany Parnell (ershenb): Approved for CCC Secretary
3. 12/05/17 9:32 am
Brittany Parnell (ershenb): Approved for Social Sciences DSCC Chair
4. 12/07/17 9:31 am
Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Business Applications and Software Development Minor

Program Requirements and Description

The Minor requires 15 credit hours, as follows:

Required Courses:	6
<u>IS&T 3553</u> Modular Software Systems in Java	
<u>IS&T 5520</u> Data Science and Machine Learning with Python	
And three courses from the following list:	9
<u>IS&T 1552</u> Implementing Information Systems: Data Perspective	
<u>IS&T 3131</u> Computing Internals And Operating Systems	
<u>IS&T 3420</u> Introduction to Data Science and Management	
<u>IS&T 3423</u> Database Management	
<u>IS&T 3443</u> Database Applications in Business	
<u>ERP 5240</u> Enterprise Application Development and Software Security	

Justification for
request

Demand from recruiters for students with a focus in this area, plus input from our Advisory Board.

Supporting
Documents

Course Reviewer
Comments

ershenb (12/05/17 9:36 am): Approved the course form per the request of Dr. Flachsbart (technical issues).

Key: 255

Program Change Request

New Program Proposal

Date Submitted: 11/30/17 7:53 am

Viewing: **PROPOSED : Minor in Financial Technology (FinTech)**

File: 256

Last edit: 12/05/17 12:14 pm

Changes proposed by: barryf

Start Term	Fall 2018
Program Code	PROPOSED
Department	Business and Information Technology
Title	

In Workflow

1. RBUSADMN Chair
2. CCC Secretary
3. Social Sciences DSCC Chair
4. Pending CCC Agenda post
5. CCC Meeting Agenda
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. Kristy Giacomelli

Approval Path

1. 11/30/17 7:28 pm
siauk: Approved for RBUSADMN Chair
2. 12/04/17 3:32 pm
Brittany Parnell (ershenb): Approved for CCC Secretary
3. 12/05/17 12:13 pm
Brittany Parnell (ershenb): Approved for Social Sciences DSCC Chair
4. 12/07/17 11:03 am
Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

Minor in Financial Technology (FinTech)

Program Requirements and Description

The Minor requires 15 credit hours, as follows:

Required Courses:	9
<u>FINANCE 2150</u>	Corporate Finance I
<u>FINANCE 5310</u>	Financial Modeling
<u>IS&T 3420</u>	Introduction to Data Science and Management
And one course from the following list:	3
<u>FINANCE 5160</u>	Corporate Finance II
<u>FINANCE 5260</u>	Investments I
<u>BUS 5230</u>	Financial Statement Analysis
And one course from the following list:	3
<u>IS&T 5520</u>	Data Science and Machine Learning with Python
<u>IS&T 4641</u>	Digital Commerce and the Internet of Things
<u>IS&T 4780</u>	Human and Organizational Factors in Cybersecurity
<u>ERP 5410</u>	Use of Business Intelligence
<u>ERP 5210</u>	Performance Dashboard, Scorecard and Data Visualization

Justification for
request

Strong inputs from our Advisory Board, companies who hire our graduates, and our own research directions.

Supporting
Documents

Course Reviewer
Comments

ershenb (12/05/17 12:14 pm): Approved per the request of Dr. Flachsbart (technical issues).

Key: 256

Course Change Request

New Experimental Course Proposal

Date Submitted: 10/25/17 3:43 pm

Viewing: **BIO SCI 5001.001 : Ichthyology**

File: 4492

Last edit: 11/20/17 11:00 am

Changes proposed by: duvernell

Requested Fall 2018

Effective Change

Date

Department

Biological Sciences

Discipline

Biological Sciences (BIO SCI)

Course Number 5001

Topic ID 001

Experimental

Title

In Workflow

- 1. **RBIOLSCI Chair**
- 2. **CCC Secretary**
- 3. **Sciences DSCC Chair**
- 4. **Pending CCC Agenda post**
- 5. **CCC Meeting Agenda**
- 6. Campus Curricula Committee Chair
- 7. CAT entry
- 8. Registrar

Approval Path

- 1. 11/10/17 8:58 am
David Duvernell
(duvernell):
Approved for
RBIOLSCI Chair
- 2. 11/13/17 8:13 am
Brittany Parnell
(ershenb):
Approved for CCC
Secretary
- 3. 11/17/17 12:19
pm
Katie Shannon

(shannonk):
Approved for
Sciences DSCC
Chair

4. 11/21/17 3:25 pm

Brittany Parnell

(ershenb):

Approved for

Pending CCC

Agenda post

Ichthyology

Experimental

Ichthyology

Abbreviated

Course Title

Instructors

David Duvernell

Experimental

Catalog

Description

An introduction to evolutionary relationships, ecology, morphology, physiology and behavior of fishes, with emphasis on local fauna.

Prerequisites

Bio Sci 1113 or Bio Sci 1213 and Bio Sci 1219, Bio Sci 1223 and Bio Sci 1229

Field Trip

Statement

There will be four or five Saturday field collecting trips scheduled in the first six weeks of the semester, and students will be required to attend at least three of them.

Credit Hours

LEC: 3

LAB: 1

IND: 0

RSD: 0

Total: 4

Justification for

new course:

This course will add a critical organismal diversity dimension to enhance both undergraduate and graduate programs. The Biological Sciences undergraduate and graduate programs do not currently offer any advanced organismal diversity courses on a regular basis. In addition, these programs offer relatively few options for students to enroll in lab courses or field courses.

Semester(s)

previously taught

none

Co-Listed

Courses:

Course Reviewer

Comments

Key: 4492

[Preview Bridge](#)

Course Change Request

New Experimental Course Proposal

Date Submitted: 11/10/17 8:56 am

Viewing: **BIO SCI 5001.002 : Population and Conservation Genetics**

File: 4497

Last edit: 12/07/17 11:20 am

Changes proposed by: duvernellid

Requested	Fall 2018
Effective Change Date	
Department	Biological Sciences
Discipline	Biological Sciences (BIO SCI)
Course Number	5001
Topic ID	002
Experimental Title	

In Workflow

1. **RBIOLSCI Chair**
2. **CCC Secretary**
3. **Sciences DSCC Chair**
4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**
6. Campus Curricula Committee Chair
7. CAT entry
8. Registrar

Approval Path

1. 11/10/17 8:59 am
David Duvernell (duvernellid):
Approved for
RBIOLSCI Chair
2. 11/13/17 9:33 am
Brittany Parnell (ershenb):
Approved for CCC
Secretary
3. 11/17/17 12:20 pm
Katie Shannon (shannonk):

Approved for
Sciences DSCC
Chair

4. 11/21/17 3:25 pm

Brittany Parnell
(ershenb):

Approved for
Pending CCC
Agenda post

5. 12/07/17 10:56
am

Brittany Parnell
(ershenb):

Rollback to
Sciences DSCC
Chair for CCC
Meeting Agenda

6. 12/07/17 11:20
am

Katie Shannon
(shannonk):

Approved for
Sciences DSCC
Chair

7. 12/07/17 11:31
am

Brittany Parnell
(ershenb):

Approved for
Pending CCC
Agenda post

Population and Conservation Genetics

Experimental Pop and Cons Genetics
Abbreviated

Course Title**Instructors** David Duvernell**Experimental****Catalog****Description**

An overview of population genetics theory with a focus on evolutionary processes (mutation, natural selection, genetic drift, inbreeding, recombination and gene flow), and a review of molecular data collection and analysis methods. Emphasis will be placed on application to conservation genetics with a review of examples from current literature.

Prerequisites

Bio Sci 2223, Bio Sci 2233.

Field Trip**Statement**

Credit Hours	LEC: 3	LAB: 0	IND: 0	RSD: 0
Total: 3				

Justification for**new course:**

The topic of population and conservation genetics synthesizes the fields of molecular genetics and evolutionary biology with a focus on examples at the organism and population level. The Biological Sciences program is in need of more organism and population level courses, and this course fills that need while potentially appealing to students who think they are more interested in molecular biology.

Semester(s)

previously taught

none

Co-Listed

Courses:

Course Reviewer

Comments

ershenb (12/07/17 10:56 am): Rollback: Rollback per the request of Dr. Shannon and Dr. Duvernell

Key: 4497

[Preview Bridge](#)

Course Change Request

New Experimental Course Proposal

Date Submitted: 10/25/17 4:19 pm

Viewing: **CIV ENG 4001.001 : Infrastructure Sustainability through Recycling**

File: 4491

Last edit: 11/21/17 3:15 pm

Changes proposed by: abdelrahmanm

Requested Spring 2018

Effective Change

Date

Department

Civil, Architectural, and Environmental Engineering

Discipline

Civil Engineering (CIV ENG)

Course Number 4001

Topic ID 001

Experimental

Title

In Workflow

1. RCIVILEN Chair
2. CCC Secretary
3. Engineering DSCC Chair
4. Pending CCC Agenda post
5. CCC Meeting Agenda
6. Campus Curricula Committee Chair
7. CAT entry
8. Registrar

Approval Path

1. 11/14/17 3:48 pm
Kristy Giacomelli (kristyg):
Approved for RCIVILEN Chair
2. 11/16/17 2:08 pm
Brittany Parnell (ershenb):
Approved for CCC Secretary
3. 11/21/17 9:53 am
sraper: Approved

for Engineering
DSCC Chair
4. 11/21/17 3:26 pm
Brittany Parnell
(ershenb):
Approved for
Pending CCC
Agenda post

Infrastructure Sustainability through Recycling

Experimental Infrastructure Recycling
Abbreviated
Course Title
Instructors Magdy Abdelrahman & Mark Fitch

Experimental
Catalog
Description

The course introduces infrastructure sustainability with a focus on recycling as used in rehabilitation techniques. Properties, types, usage, design and construction of recycled materials are presented. Environmental impacts are discussed.

Prerequisites

Preceded or accompanied by Civ Eng 3116 and preceded by Civ Eng 2601.

Field Trip

Statement

Credit Hours LEC: 2 LAB: 1 IND: 0 RSD: 0

Total: 3

Justification for

new course:

As recycling and rehabilitation of infrastructure is increasingly significant in Civil Engineering, this course provides knowledge and skills in the areas of material testing, environmental testing, and decision making related to recycling materials such as asphalt and concrete.

Semester(s)
previously taught

Co-Listed

Courses:

Course Reviewer

Comments

Key: 4491

[Preview Bridge](#)

Course Change Request

New Experimental Course Proposal

Date Submitted: 11/13/17 3:12 pm

Viewing: **CIV ENG 6001.002 : Pavement Management, Evaluation and Rehabilitation**

File: 4490

Last edit: 11/21/17 11:36 am

Changes proposed by: abdelrahmanm

Requested Spring 2018

Effective Change

Date

Department

Civil, Architectural, and Environmental Engineering

Discipline

Civil Engineering (CIV ENG)

Course Number 6001

Topic ID 002

Experimental

Title

In Workflow

1. RCIVILEN Chair
2. CCC Secretary
3. Engineering DSCC Chair
4. Pending CCC Agenda post
5. CCC Meeting Agenda
6. Campus Curricula Committee Chair
7. CAT entry
8. Registrar

Approval Path

1. 11/13/17 3:17 pm
Joel Burken
(burken):
Approved for
RCIVILEN Chair
2. 11/13/17 3:48 pm
Brittany Parnell
(ershenb):
Approved for CCC
Secretary
3. 11/21/17 9:55 am
srafer: Approved

for Engineering
DSCC Chair
4. 11/21/17 3:26 pm
Brittany Parnell
(ershenb):
Approved for
Pending CCC
Agenda post

Pavement Management, Evaluation and Rehabilitation

Experimental Pavement Management

Abbreviated

Course Title

Instructors Magdy Abdelrahman

Experimental

Catalog

Description

Advanced knowledge of pavement performance; pavement evaluation; implementation of pavement management at network and project levels; maintenance and rehabilitation strategies; life-cycle cost analysis.

Prerequisites

Graduate Standing

Field Trip

Statement

Credit Hours LEC: 2 LAB: 1 IND: 0 RSD: 0

Total: 3

Justification for

new course:

As rehabilitation of pavement is increasingly significant in Civil Engineering, this course provides advanced knowledge and skills in the areas of rehabilitation, maintenance, and decision making related to pavement management.

The course will build background for graduate students conducting research in the area of pavement engineering.

Semester(s)

previously taught

Co-Listed

Courses:

Course Reviewer

Comments

sraper (11/15/17 8:01 am): removed hyphen from course description.

Key: 4490

[Preview Bridge](#)

Course Change Request

New Experimental Course Proposal

Date Submitted: 11/03/17 6:12 pm

Viewing: **COMP SCI 3001.002 : Introduction to Data Science**

File: 4494

Last edit: 11/21/17 12:01 pm

Changes proposed by: tauritzd

Requested Fall 2018

Effective Change

Date

Department

Computer Science

Discipline

Computer Science (COMP SCI)

Course Number 3001

Topic ID 002

Experimental

Title

In Workflow

1. RCOMPSCI Chair
2. CCC Secretary
3. Engineering DSCC Chair
4. Pending CCC Agenda post
5. CCC Meeting Agenda
6. Campus Curricula Committee Chair
7. CAT entry
8. Registrar

Approval Path

1. 11/04/17 10:08 am
George Markowsky (markowskyg):
Approved for RCOMPSCI Chair
2. 11/06/17 9:15 am
Brittany Parnell (ershenb):
Approved for CCC Secretary

- 3. 11/21/17 9:56 am
srafer: Approved
for Engineering
DSCC Chair
- 4. 11/21/17 3:26 pm
Brittany Parnell
(ershenb):
Approved for
Pending CCC
Agenda post

Introduction to Data Science

Experimental Intro to Data Science

Abbreviated

Course Title

Instructors Yanjie Fu

Experimental

Catalog

Description

This course introduces the fundamental concepts and lifecycle of data science, including (1) programming languages for data science, (2) data representation, collection and preprocessing, (3) data indexing, retrieval and management, (4) data mining, modeling, and visualization, (5) data security and privacy, and (6) data science system development.

Prerequisites

A grade of "C" or better in Comp Sci 2300, in Comp Sci 2500, and in one of Stat 3113, Stat 3115, Stat 3117 or Stat 5643.

Field Trip

Statement

None

Credit Hours	LEC: 3	LAB: 0	IND: 0	RSD: 0
--------------	--------	--------	--------	--------

Total: 3

Justification for

new course:

Computer scientists increasingly work in data science, yet currently there is no undergraduate course in data science with a technically challenging computer science focus. This proposed new course remedies that lack and meets strong student demand for such a course, providing both an undergraduate level treatment of this timely material and complementing, as well as providing a foundation for, our graduate course offering in data mining, machine learning, computer vision, and deep learning.

Semester(s)

previously taught

None

Co-Listed

Courses:

Course Reviewer

Comments

Key: 4494

[Preview Bridge](#)

Course Change Request

New Experimental Course Proposal

Date Submitted: 10/31/17 12:57 pm

Viewing: **ELEC ENG 3001.001 : Intelligent Robotics**

File: 4496

Last edit: 11/21/17 12:13 pm

Changes proposed by: kte

Requested Fall 2018

Effective Change

Date

Department

Electrical and Computer Engineering

Discipline

Electrical Engineering (ELEC ENG)

Course Number 3001

Topic ID 001

Experimental

Title

In Workflow

1. RELECENG Chair
2. CCC Secretary
3. Engineering DSCC Chair
4. Pending CCC Agenda post
5. CCC Meeting Agenda
6. Campus Curricula Committee Chair
7. CAT entry
8. Registrar

Approval Path

1. 11/04/17 3:57 pm
Daryl Beetner
(daryl): Approved for RELECENG Chair
2. 11/06/17 4:11 pm
Brittany Parnell
(ershenb):
Approved for CCC Secretary
3. 11/21/17 9:57 am
srafer: Approved

for Engineering
DSCC Chair
4. 11/21/17 3:26 pm
Brittany Parnell
(ershenb):
Approved for
Pending CCC
Agenda post

Intelligent Robotics

Experimental Intelligent Robotics
Abbreviated
Course Title
Instructors Jagannathan Sarangapani

Experimental
Catalog

Description

Introduction to robotics, coordinate transformation, D-H parameters, forward and inverse kinematics, dynamics, state space representation, linear and computed torque control, sensing and intelligence, intelligent control.

Prerequisites

Elec Eng 2120, Math 3108, Math 3304, each with a grade of "C" or better; passing the Elec Eng Advancement Exam II.

Field Trip

Statement

Credit Hours LEC: 3 LAB: 0 IND: 0 RSD: 0

Total: 3

Justification for
new course:

Increasing interest in robotics and lack of robotics courses at the undergraduate (below 5000 level) curriculum.

Semester(s)

previously taught

None

Co-Listed

Courses:

COMP ENG 3001 - Special Topics

Course Reviewer

Comments

sraper (11/13/17 10:03 am): added "C" or better requirement to prereqs per K. Erickson and clarified as well.

sraper (11/21/17 9:57 am): Modified course description as provided by K. Erickson (EE).

Key: 4496

[Preview Bridge](#)

Course Change Request

New Experimental Course Proposal

Date Submitted: 10/23/17 3:30 pm

Viewing: **ELEC ENG 6001.006 : Introduction to Nonlinear Optics**

File: 4488

Last edit: 11/21/17 12:14 pm

Changes proposed by: sweetk

Requested Spring 2018

Effective Change

Date

Department

Electrical and Computer Engineering

Discipline

Electrical Engineering (ELEC ENG)

Course Number 6001

Topic ID 006

Experimental

Title

In Workflow

1. RELECENG Chair
2. CCC Secretary
3. Engineering DSCC Chair
4. Pending CCC Agenda post
5. CCC Meeting Agenda
6. Campus Curricula Committee Chair
7. CAT entry
8. Registrar

Approval Path

1. 10/25/17 12:03 pm
Daryl Beetner (daryl): Approved for RELECENG Chair
2. 10/25/17 12:21 pm
Brittany Parnell (ershenb): Approved for CCC Secretary

- 3. 11/21/17 9:57 am
srafer: Approved
for Engineering
DSCC Chair
- 4. 11/21/17 3:26 pm
Brittany Parnell
(ershenb):
Approved for
Pending CCC
Agenda post

Introduction to Nonlinear Optics

Experimental Nonlinear Optics

Abbreviated

Course Title

Instructors Jie Huang

Experimental

Catalog

Description

This course bridges the gap between conventional courses in optics/electromagnetics and the modern applications of optics in spectroscopy and photonics. The course will provide insight into the physical principle of nonlinear optics and interaction of light with matter from the introduction of anisotropic media to second and third order nonlinear optics.

Prerequisites

A basic background in optics or electromagnetics is recommended.

Field Trip

Statement

Credit Hours LEC: 3.0 LAB: 0 IND: 0 RSD: 0

Total: 3.0

Justification for

new course:

The field of nonlinear optics emerges from a number of disciplines including electrical engineering, physics, materials science and engineering, and mechanical engineering. The proposed course is designed to bridge the gap between the conventional courses in optics/electromagnetics and the modern applications of optics in spectroscopy and photonics. There is no similar course on campus. Missouri S&T has more than 20 faculty working in optics and photonics, but only offers a few courses related to optics. This course will benefit the graduate students pursuing their M.S. or Ph.D. degrees in photonics, physics, electrical engineering and materials science.

Semester(s)
previously taught

Co-Listed

Courses:

Course Reviewer

Comments

Key: 4488

[Preview Bridge](#)

Course Change Request

New Experimental Course Proposal

Date Submitted: 11/30/17 8:07 am

Viewing: **HISTORY 3001.003 : Slavery in the Atlantic World**

File: 4504

Last edit: 12/07/17 9:38 am

Changes proposed by: popejj

Requested	Fall 2018
Effective Change Date	
Department	History and Political Science
Discipline	History (HISTORY)
Course Number	3001
Topic ID	003
Experimental Title	

In Workflow

1. RHISTORY Chair
2. CCC Secretary
3. Arts & Humanities DSCC Chair
4. Pending CCC Agenda post
5. CCC Meeting Agenda
6. Campus Curricula Committee Chair
7. CAT entry
8. Registrar

Approval Path

1. 11/30/17 8:34 am
sfogg: Approved for RHISTORY Chair
2. 11/30/17 10:06 am
Brittany Parnell (ershenb):
Approved for CCC Secretary
3. 12/01/17 9:03 am
Petra Dewitt (dewittp):

Approved for Arts
& Humanities
DSCC Chair
4. 12/07/17 9:38 am
Brittany Parnell
(ershenb):
Approved for
Pending CCC
Agenda post

Slavery in the Atlantic World

Experimental Slavery Atlantic World
Abbreviated
Course Title
Instructors Pope

Experimental Catalog Description

This course explores the role of slavery in the history of the Americas, Europe, and Africa. By focusing on the development of “New World Slavery,” the course evaluates how slavery shaped the world we live in today.

Prerequisites

HIST 1100 or HIST 1200 or HIST 1300.

Field Trip Statement

Credit Hours	LEC: 3	LAB: 0	IND: 0	RSD: 0
Total: 3				

Justification for new course:

Missouri S&T does not currently offer a course on American or world slavery.

Semester(s)
previously taught

Co-Listed
Courses:

Course Reviewer
Comments

Key: 4504

[Preview Bridge](#)

Course Change Request

New Experimental Course Proposal

Date Submitted: 11/29/17 6:41 pm

Viewing: **MECH ENG 6001.002 : Fundamentals of Metal Additive Manufacturing Processes**

File: 4502

Last edit: 12/07/17 11:19 am

Changes proposed by: nisbett

Requested	Spring 2018
Effective Change Date	
Department	Mechanical & Aerospace Engineering
Discipline	Mechanical Engineering (MECH ENG)
Course Number	6001
Topic ID	002
Experimental Title	

In Workflow

1. RMECHENG Chair
2. CCC Secretary
3. Engineering DSCC Chair
4. Pending CCC Agenda post
5. CCC Meeting Agenda
6. Campus Curricula Committee Chair
7. CAT entry
8. Registrar

Approval Path

1. 11/30/17 7:28 am
James Drallmeier (drallmei):
Approved for RMECHENG Chair
2. 11/30/17 10:03 am
Brittany Parnell (ershenb):
Approved for CCC Secretary
3. 12/04/17 1:36 pm
srapar: Approved for Engineering

DSCC Chair
 4. 12/07/17 11:21
 am
 Brittany Parnell
 (ershenb):
 Approved for
 Pending CCC
 Agenda post

Fundamentals of Metal Additive Manufacturing Processes

Experimental Metal Additive Manufact
 Abbreviated
 Course Title
 Instructors Lianyi Chen

Experimental
 Catalog
 Description

This course covers the fundamental physics in metal additive manufacturing processes, particularly the following processes: powder flow and spattering, laser-powder interaction, melt pool dynamics, solidification, postprocessing, residual stress evolution, and additive manufacturing of emerging materials (metal matrix composites and metallic glasses).

Prerequisites

Mech Eng 5519 or Mech Eng 5525.

Field Trip
 Statement

Credit Hours LEC: 3 LAB: 0 IND: 0 RSD: 0
 Total: 3

Justification for
 new course:

Important developing area of research and application.

Semester(s)

previously taught

None

Co-Listed

Courses:

Course Reviewer

Comments

sraper (12/04/17 1:36 pm): Changed prereq statement.

Key: 4502

[Preview Bridge](#)

Course Change Request

New Experimental Course Proposal

Date Submitted: 11/17/17 1:55 pm

Viewing: **NUC ENG 2001.001 : Professional Development for Nuclear Engineers**

File: 4498

Last edit: 11/21/17 3:17 pm

Changes proposed by: schlegelj

Requested Fall 2018

Effective Change

Date

Department

Mining & Nuclear Engineering

Discipline

Nuclear Engineering (NUC ENG)

Course Number 2001

Topic ID 001

Experimental

Title

In Workflow

1. **RMINNUCL Chair**
2. **CCC Secretary**
3. **Engineering DSCC Chair**
4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**
6. Campus Curricula Committee Chair
7. CAT entry
8. Registrar

Approval Path

1. 11/17/17 2:10 pm
Braden lusk
(blusk): Approved for RMINNUCL Chair
2. 11/20/17 10:39 am
Brittany Parnell
(ershenb):
Approved for CCC Secretary
3. 11/21/17 9:58 am
srafer: Approved

for Engineering
DSCC Chair
4. 11/21/17 3:26 pm
Brittany Parnell
(ershenb):
Approved for
Pending CCC
Agenda post

Professional Development for Nuclear Engineers

Experimental Prof Dev Nuc Eng

Abbreviated

Course Title

Instructors Joshua Schlegel

Experimental

Catalog

Description

An outline of key topics in professional development important for the success of engineering students both during their education and in their profession. Content will range from resume development to technical writing, problem solving approaches, and using computers to solve various types of engineering problems.

Prerequisites

Co-requisite: Comp Sci 1971 or Comp Sci 1972.

Field Trip

Statement

Credit Hours LEC: 1 LAB: 0 IND: 0 RSD: 0

Total: 1

Justification for
new course:

This course is intended to help students prepare for internships and job searches and help familiarize them with tools and approaches they will need as they progress through their nuclear engineering program.

Semester(s)
previously taught

None

Co-Listed

Courses:

Course Reviewer

Comments

Key: 4498

[Preview Bridge](#)

Course Change Request

Date Submitted: 05/05/17 2:09 pm

Viewing: **ARCH ENG 4800 5872: Principles of HVAC I Environmental Controls**

File: 942.1

Last edit: 05/16/17 9:18 am

Changes proposed by: baur

In Workflow

1. RCIVILEN Chair
2. CCC Secretary
3. Engineering DSCC Chair
4. Pending CCC Agenda post
5. CCC Meeting Agenda
6. Campus Curricula Committee Chair
7. FS Meeting Agenda
8. Faculty Senate Chair
9. Registrar
10. Lynn Shelton
11. Peoplesoft

Programs
referencing this
course

[ARC ENG-BS: Architectural Engineering BS](#)

Requested **Fall 2018 08/01/2014**

Effective Change

Date

Department

Civil, Architectural, and Environmental Engineering

Discipline

Architectural Engineering (ARCH ENG)

Course Number **4800 5872**

Title

Approval Path

1. 05/11/17 11:36 am
Joel Burken
(burken):
Approved for
RCIVILEN Chair
2. 05/12/17 9:56 am
Brittany Parnell

- (ershenb):
 Approved for CCC
 Secretary
3. 05/22/17 12:30
 pm
 scraper: Approved
 for Engineering
 DSCC Chair
4. 06/28/17 4:03 pm
 Brittany Parnell
 (ershenb):
 Approved for
 Pending CCC
 Agenda post

Principles of HVAC I Environmental Controls

Abbreviated

Principles of HVAC I

Course Title

Environmental Controls

Catalog

Description

Heating, ventilating, and air conditioning Theory and applications of principles related to the heat loss and heat gain calculations for commercial buildings. of heating, ventilating, and air conditioning equipment and systems; design problems. Calculations will be performed manually and using current computer software. Analysis and specification of the building envelope components, with an emphasis on improving energy efficiency by reducing heating and cooling loads Physiological and psychological factors relating to environmental control.

Prerequisites

Mech Eng ~~3521 and accompanied or preceded by Mech Eng 3525; or Mech Eng 2527~~ and Civ Eng 3330.

Field Trip

Statement

Credit Hours LEC: 3 LAB: 0 IND: 0 RSD: 0
Total: 3

Required for **Yes** ~~No~~
Majors

Elective for No
Majors

Justification for
change:

The architectural engineering program is realigning the building systems courses to provide a path for a continuous design project. The realignment and renumbering of courses include environmental controls, building lighting systems and building electrical systems. When complete a student project that was initially started in architectural design will be carried through environmental controls and building lighting systems. The same project will be forwarded to building electrical systems course once complete it will have a fully designed building environmental systems in place.

Semesters
previously
offered as an
experimental
course

Co-Listed
Courses:

~~MECH-ENG 5571 - Environmental Controls~~

Course Reviewer

Comments

lahne (05/05/17 11:57 am): Rollback: .

sraper (05/16/17 9:18 am): Changed effective date to Fall 18 and checked required for majors box. Approval subject to DC form to be submitted.

Course Change Request

Date Submitted: 05/01/17 2:42 pm

Viewing: **ARCH ENG 4820 ~~3805~~: Building**

Lighting Systems

File: 2069.5

Last approved: 09/21/15 3:55 am

Last edit: 10/31/17 11:26 am

Changes proposed by: baur

Programs
referencing this
course

[ARC ENG-BS: Architectural Engineering BS](#)

Requested **Fall 2018** ~~Spring 2016~~

Effective Change

Date

Department

Civil, Architectural, and Environmental Engineering

Discipline

Architectural Engineering (ARCH ENG)

Course Number **4820 ~~3805~~**

Title

In Workflow

1. **RCIVILEN Chair**
2. **CCC Secretary**
3. **Engineering DSCC Chair**
4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**

6. Campus Curricula Committee Chair
7. FS Meeting Agenda

8. Faculty Senate Chair

9. Registrar

10. Lynn Shelton

11. Peoplesoft

Approval Path

1. 05/11/17 11:36 am

Joel Burken
(burken):

Approved for
RCIVILEN Chair

2. 05/12/17 9:57 am

Brittany Parnell

(ershenb):
Approved for CCC
Secretary

3. 05/22/17 12:30
pm

craper: Approved
for Engineering
DSCC Chair

4. 06/28/17 4:24 pm
Brittany Parnell

(ershenb):
Approved for
Pending CCC
Agenda post

History

1. Sep 21, 2015 by
baur (2069.1)

Building Lighting Systems

Abbreviated Bldg Light Syst

Course Title

Catalog

Description

Design and specifications for interior and exterior building illumination systems.

Work includes study of applicable NFPA 70 (NEC) and related building codes.

Prerequisites

Arch Eng **3804** ~~3803~~ and **Physics 2135** ~~Arch Eng 3804~~.

Field Trip

Statement

Credit Hours

LEC: 3

LAB: 0

IND: 0

RSD: 0

Total: 3

Required for
Majors

Yes

Elective for
Majors

No

Justification for
change:

The architectural engineering program is realigning the building systems courses to provide a path for a continuous design project. The realignment and renumbering of courses include environmental controls, building lighting systems and building electrical systems. When complete a student project that was initially started in architectural design will be carried through environmental controls and building lighting systems. The same project will be forwarded to building electrical systems course once complete it will have a fully designed building environmental systems in place.

Semesters
previously
offered as an
experimental
course

ArchE 3805 typically has an enrollment of 40 students. Student enrollment numbers are expected to be similar.

Co-Listed
Courses:

Course Reviewer

Comments

sraper (05/16/17 9:20 am): Changed effective date to Fall 2018. Approval subject to DC form submission.

Course Change Request

Date Submitted: 05/01/17 2:34 pm

Viewing: **ARCH ENG 4850 ~~3803~~: Building**

Electrical Systems

File: 4219.5

Last approved: 09/21/15 3:55 am

Last edit: 10/31/17 11:27 am

Changes proposed by: baur

In Workflow

1. RCIVILEN Chair
2. CCC Secretary
3. Engineering DSCC Chair
4. Pending CCC Agenda post
5. CCC Meeting Agenda

Programs
referencing this
course

[ARC ENG-BS: Architectural Engineering BS](#)

6. Campus Curricula Committee Chair
7. FS Meeting Agenda

Requested **Fall 2018** ~~Spring 2016~~

Effective Change

Date

Department

Civil, Architectural, and Environmental Engineering

Discipline

Architectural Engineering (ARCH ENG)

Course Number **4850 ~~3803~~**

Title

8. Faculty Senate Chair
9. Registrar
10. Lynn Shelton
11. Peoplesoft

Approval Path

1. 05/11/17 11:36 am
Joel Burken
(burken):

Approved for
RCIVILEN Chair

2. 05/12/17 9:58 am
Brittany Parnell

(ershenb):

Approved for CCC
Secretary

3. 05/22/17 12:30
pm

craper: Approved
for Engineering
DSCC Chair

4. 06/28/17 4:25 pm
Brittany Parnell

(ershenb):

Approved for
Pending CCC
Agenda post

History

1. Sep 21, 2015 by
Stuart Baur (baur)

Building Electrical Systems

Abbreviated Bldg Elect Syst

Course Title

Catalog

Description

The design of interior and exterior building electrical systems, including power loads, branch circuits and switching. Work includes study of applicable NFPA 70 (NEC) and related building codes.

Prerequisites

Arch Eng 4800 and Arch Eng 4820 ~~Math 3304 and Physics 2135.~~

Field Trip

Statement

Credit Hours

LEC: 3

LAB: 0

IND: 0

RSD: 0

Total: 3

Required for Yes

Majors

Elective for No

Majors

Justification for
change:

The architectural engineering program is realigning the building systems courses to provide a path for a continuous design project. The realignment and renumbering of courses include environmental controls, building lighting systems and building electrical systems. When complete a student project that was initially started in architectural design will be carried through environmental controls and building lighting systems. The same project will be forwarded to building electrical systems course once complete it will have a fully designed building environmental systems in place.

Semesters
previously
offered as an
experimental
course

This ~~will be the new pre-requisite for ArchE 3805, which~~ typically has an enrollment of 40 students. ~~As the pre-requisite for ArchE 3805, student enrollment numbers are expected to be similar.~~

Co-Listed

Courses:

Course Reviewer

Comments

sraper (05/16/17 9:21 am): Changed effective date to Fall 2018. Approval subject to DC form submission.

Course Change Request

New Experimental Course Proposal

Date Submitted: 08/09/17 10:55 am

Viewing: **CHEM ENG 4001.001 :**

Introduction to Phase Equilibrium

File: 4440

Last edit: 10/31/17 11:23 am

Changes proposed by: marlene

Requested Spring 2018

Effective Change

Date

Department

Chemical and Biochemical Engineering

Discipline

Chemical Engineering (CHEM ENG)

Course Number 4001

Topic ID 001

Experimental

Title

In Workflow

1. **RCHEMENG Chair**
2. **CCC Secretary**
3. **Engineering DSCC Chair**
4. **Pending CCC Agenda post**
5. **CCC Meeting Agenda**
6. Campus Curricula Committee Chair
7. Registrar

Approval Path

1. 08/10/17 1:46 pm
Muthanna Al-Dahhan
(aldahhanm):
Approved for
RCHEMENG Chair
2. 08/15/17 10:05
am
Brittany Parnell
(ershenb):
Rollback to
RCHEMENG Chair
for CCC Secretary

3. 08/30/17 9:57 am
Muthanna Al-
Dahhan
(aldahhanm):
Approved for
RCHEMENG Chair
4. 08/30/17 10:13
am
Brittany Parnell
(ershenb):
Approved for CCC
Secretary
5. 09/08/17 2:48 pm
sraper: Approved
for Engineering
DSCC Chair
6. 09/19/17 11:27
am
Brittany Parnell
(ershenb):
Approved for
Pending CCC
Agenda post
7. 10/04/17 9:28 am
Brittany Parnell
(ershenb):
Rollback to
Engineering DSCC
Chair for CCC
Meeting Agenda
8. 10/04/17 9:43 am
sraper: Approved

for Engineering
DSCC Chair
9. 10/12/17 1:22 pm
Brittany Parnell
(ershenb):
Approved for
Pending CCC
Agenda post

Introduction to Phase Equilibrium

Experimental Phase Equilibrium

Abbreviated

Course Title

Instructors Dr. Christi Luks

Experimental

Catalog

Description

This course is intended as a supplement to a mechanical Thermodynamics 1 course to prepare students for Thermodynamics 2. Review of the first and second law of thermodynamics for pure substances with emphasis on finding data for pure substances via fundamental relations and equations of state; phase equilibrium and fugacity of pure substances.

Prerequisites

Mech Eng 2519 and Math 2222.

Field Trip

Statement

Credit Hours LEC: 1 LAB: 0 IND: 0 RSD: 0

Total: 1

Justification for

new course:

We have found that students transferring Mechanical Engineering Thermodynamics do not have the necessary foundation in phase equilibria to be successful in our second thermodynamics course (Phase Equilibrium for multicomponents)

Semester(s)

previously taught

Co-Listed

Courses:

Course Reviewer

Comments

ershenb (08/15/17 10:05 am): Rollback: Missed the EC Submission for Fall 2017 deadline. Please adjust to Spring 2018.

ershenb (08/30/17 10:13 am): updated the effective date to Spring 2018.

ershenb (10/04/17 9:28 am): Rollback: Rollback for edits,per the request of Dr. Raper

sraper (10/04/17 9:43 am): Changed prereq. Removed "taught in previous..." statement.

Key: 4440

[Preview Bridge](#)

PROPOSED: MASTER OF SCIENCE IN EXPLOSIVES TECHNOLOGY

In Workflow

1. RMINNUCL Chair (blusk@mst.edu)
2. CCC Secretary (ershenb@mst.edu)
3. Engineering DSCC Chair (sraper@mst.edu)
4. Pending CCC Agenda post (ershenb@mst.edu)
5. CCC Meeting Agenda (ershenb@mst.edu)
6. Campus Curricula Committee Chair (sraper@mst.edu)
7. FS Meeting Agenda (ershenb@mst.edu)
8. Faculty Senate Chair (sedighs@mst.edu)
9. Registrar (kristyg@mst.edu)
10. Kristy Giacomelli (kristyg@mst.edu)

Approval Path

1. Wed, 08 Mar 2017 16:13:51 GMT
Braden lusk (blusk): Approved for RMINNUCL Chair
2. Wed, 08 Mar 2017 17:13:07 GMT
Kristy Giacomelli (kristyg): Approved for CCC Secretary
3. Mon, 15 May 2017 21:10:12 GMT
sraper: Approved for Engineering DSCC Chair
4. Fri, 30 Jun 2017 14:38:19 GMT
Brittany Parnell (ershenb): Approved for Pending CCC Agenda post

New Program Proposal

Date Submitted: Tue, 07 Mar 2017 00:34:10 GMT

Viewing: PROPOSED : Master of Science in Explosives Technology

File: 249

Last edit: Mon, 15 May 2017 21:10:09 GMT

Changes proposed by: kapqh4

Start Term

Spring 2018

Program Code

PROPOSED

Department

Mining & Nuclear Engineering

Title

Master of Science in Explosives Technology

Program Requirements and Description

The explosives engineering program in the department of mining and nuclear engineering offers the master of science (M.S.) and doctor of philosophy (Ph.D.) degrees and a minor and certificate in explosives engineering for students with bachelor's degrees in engineering, science or technology. It also offers an explosives technology certificate and master of science (MS) for those with other bachelor's degrees. Due to the age profile of the explosives industry and attrition of personnel, as well as the rapid change in technology within this field, there is an immediate and growing need for highly trained explosives professionals in both the civilian explosive, mining and civil excavating fields and government and the defense industry. Employers are looking for engineers and scientists with sophisticated skills in the integration of explosives technology into complex systems in a wide range of applications. Employers are also seeking M.S. and Ph.D. graduates because they can move quickly into managerial positions.

Faculty involved in a variety of explosives related research programs teach and direct the program in conjunction with instruction by industry specialists in a wide range of applications. Students will have opportunities to assist the faculty, both in research and teaching, as well as working alongside faculty and graduate students in other engineering and science fields such as civil, architectural, mechanical, chemical, aerospace, electrical, geological and materials engineering and geology, geophysics, chemistry and physics. The explosives engineering faculty and students will be active in the leading professional societies such as the International Society for Explosives Engineers and those in a wide range of associated areas. A security background check is required for all students in the program.

The M.S. program requires a minimum of 30 hours of graduate credit. A core of four courses is required of all students, and a module of allied courses in departments outside of explosives engineering is encouraged.

M.S. with thesis: The M.S. degree with thesis requires the completion of 24 hours of graduate course work and six hours of research (Exp Eng 6099), and the successful completion and defense of a research thesis.

Four of the following core courses are required of all M.S. students in Explosives Engineering:

Exp Eng 5612	Principles of Explosives Engineering Exp Eng 5622	Blasting Design and Technology
Exp Eng 5713	Demolition of Buildings and Structures	
Exp Eng 5922	Tunneling and Underground Construction Techniques	
Exp Eng 6412	Environmental Controls for Blasting	
Exp Eng 6312	Scientific Instrumentation for Explosives and Blasting	

Four of the following core courses are required of all M.S. students in Explosives Technology:

Exp Eng 5612	Principles of Explosives Engineering Exp Eng 5622	Blasting Design and Technology
Exp Eng 5711	Explosives in Industry	
Exp Eng 5713	Demolition of Buildings and Structures	
Exp Eng 5721	Specialty Uses of Energetic Materials	
Exp Eng 5914	Explosives Manufacturing	
Exp Eng 5922	Tunneling and Underground Construction Techniques	
Exp Eng 5711	Environmental Controls for Blasting	
Exp Eng 5721	Scientific Instrumentation for Explosives and Blasting	
Exp Eng 6112	Explosives Regulations	

Students select 12 hours of Exp Eng and other appropriate elective courses. M.S. in explosives engineering and explosives technology candidates are advised to group out-of-department courses into a module that fits their special interest.

M.S. without thesis (by coursework): The M.S. degree without thesis requires the completion of 30 hours of graduate coursework with the same stipulations as above. The six hours of research is replaced by course work which may include an explosives related cooperative work experience (Exp Eng 6070) or industry project (Exp Eng 6080) with an established company or government agency commonly using explosives and an additional explosives course.

Justification for request

We are applying for an M.S. degree in Explosives Technology. Building on our Masters of Explosives Engineering degree, the Masters of Explosives Technology degree has high potential for attracting students from our online certificate program, particularly from the military and government. The ATF, which currently sends 30-40 agents per year through our Explosives Technology Certificate program, has requested that we make changes to the Certificate program (currently in progress) to accommodate an extra 30-40 agents a year and also develop a Masters of Explosives Technology degree.

We receive a constant stream of inquires about our current program. However prospective students without an engineering or physical science degree are currently limited in their options. The Graduate Certificate in Explosives Technology was developed in response to the demand from these students. However, in order to continue on to the M.S. in Explosives Engineering, a series of makeup/prerequisite courses are required for most of these students. An M.S. in Explosives Technology would allow these students (who are mostly military) to continue on. The ATF has requested that we develop the degree so that their agents can continue on to an M.S. degree. Currently only a handful of the agents that have received the Explosives Technology Graduate Certificate have had engineering or physical science degrees. They are wanting to double the number of agents they send through this program and to encourage their agents to continue on to an M.S. degree, and have requested that we develop the M.S. in Explosives Technology degree. In addition it would cater to the demand from military EOD and other students.

There will continue to be growing opportunities for graduates with explosives qualifications in the defense, consulting and explosives manufacturing industries and in government. It is expected that the overwhelming majority of our online students will already have a job in industry, the military or a government agency and will be using the M.S. to advance their career, but we would also like to be able to offer the degree on campus so that students can complete the degree in a shorter time frame and move on to a new career. We have already had army officers come to campus and complete their M.S. degree in Explosives Engineering upon their separation from the army

Supporting Documents

Explosives Technology MS Proposal 3-06-17.pdf
FinancialProjections - MS Explosives Technology.xlsx

Course Reviewer Comments

sraper (Mon, 15 May 2017 21:10:09 GMT): There were no objections from the DSCC to this new program.

Key: 249

NEW DEGREE PROGRAM PROPOSAL

Sponsoring Campus: Missouri University of Science and Technology
College or School: College of Engineering and Computing
Department: Mining and Nuclear Engineering
Program Title: Explosives Technology
Degree: Master of Science (M.S.) in Explosives Technology
Options (emphasis areas): No options (N/A)

Delivery Site(s): Missouri University of Science and Technology

CIP Classification: 142101

Implementation Date: Fall 2018

Expected Date of First Graduation: May 2020

Authors of Proposal: Dr. Kyle Perry & Dr. Gillian Worsey

Name and Phone Number of Person to Contact for More Information:

Perry: 573-341-4549 Worsey: 573-341-4753

Individual(s) Responsible for Success of Program:

Paul Worsey, Associate Chair of Explosives Engineering

Braden Lusk, MNE Department Chair

Table of Contents

Executive Summary	1
1. Introduction	2
2. Fit With University Mission and Other Academic Programs	4
2.A. Alignment With Mission and Goals	4
2.B. Duplication and Collaboration Within Campus and Across System	5
3. Business-Related Criteria and Justification.....	5
3.A. Market Analysis: Program Need and Demand.....	5
3.A.1 Need for Program	5
3.A.2 Student Demand.....	7
3.B. Financial Projections.....	9
3.B.1 Expenses	9
3.B.2 Revenue.....	10
3.B.3.Net Revenue	11
3.B.4. Financial and Academic Viability	11
3.C. Business and Marketing Plan: Recruiting and Retaining Students.....	13
4. Institutional Capacity.....	14
5. Program Characteristics.....	16
5.A. Program Outcomes.....	16
5.B. Program Structure	17
5.C. Program Design and Content	20
5.D. Program Goals and Assessment	20
5.E. Student Preparation.....	20
5.F. Faculty and Administration	21
5.G. Alumni and Employer Survey.....	22
5.H. Program Accreditation.....	22
6. Security Considerations	23
7. References.....	23
8. Appendices.....	24

Executive Summary

The purpose of this proposal is to establish a M.S. degree in Explosives Technology. In 2010, a M.S. in Explosives Engineering was established for graduates with an engineering B.S., which has been very successful exceeding projections (63 M.S. awarded to date). Unfortunately, many of those interested in this program do not have engineering backgrounds and are turned away. The proposed Explosive Technology M.S. is focused on those not currently eligible. The vast majority of prospective customers in the government and military have non-engineering B.S. or B.A. degrees and this makes the proposed degree a certain success. There are many government and military agencies who would like to have their personnel (e.g. ATF agents/inspectors and military EOD [Explosives Ordinance Disposal]) earn advanced degrees in explosives.

The explosives program receives a constant stream of enquires about our current programs. However, prospective students without an engineering or physical science degree are currently limited in their options due to the series of makeup/prerequisite courses required. The Graduate Certificate in Explosives Technology was developed in response to the demand from these students. To date, there have been nine Undergraduate and 97 Graduate Certificates in Explosives Technology awarded. The ATF, which currently sends 30-40 agents per year through our two-year Explosives Technology Certificate program, has requested that we make changes to this program to accommodate an additional 30-40 Industry Operations Investigators (IOIs) per year and also develop a M.S. degree in Explosives Technology for their people. Currently, only a handful of the agents hold engineering or physical science degrees and they are projecting five per year following on from the Technology Certificate. In addition, the proposed degree would also cater to the demand from military EOD and other branches. We already have three ATF personnel signed up for FS 2017 to take the courses necessary for the Explosives Technology M.S and eight EOD technicians have applied (SS2017) in the Certificate with the intention of earning an Explosives Technology M.S. All of the above are online students and will bring in substantial income.

There will continue to be growing opportunities for graduates with explosives qualifications in the defense, consulting and explosives manufacturing industries, and in government. It is expected that the overwhelming majority of our online students will already have a job in industry, the military, or a government agency and will be using the M.S. to advance their career, but we would also like to be able to offer the degree on campus so that students can complete the degree in a shorter time frame and move on to a new career. We have already had Army officers come to campus and complete their M.S. degree in Explosives Engineering upon their separation from the Army.

We currently have faculty and staff in place for the existing explosives engineering program and are developing three additional courses for the Graduate Certificate expansion which will bring the total to 19 taught courses. With three full time explosives faculty covering the existing explosives engineering program, as well as Dr. Lusk (chair of MNE at S&T), we already have sufficient staffing levels to implement the program. However, as the Explosives Technology program grows to meet or exceed enrollment projections, we will need an additional faculty member the third year after creation.

As with our current graduate degree programs, all costs will be paid by student fees. Since nearly all students in the proposed Explosives Technology M.S. program will be paying distance course rates, a significant revenue stream is expected. In the past two years, the ATF contract for the Explosives Technology Certificate has totaled nearly \$480,000 and \$467,000 respectively and they are wanting to double the number of students in this program and estimate five students per year going on to the M.S. in Explosives Technology. In addition, we estimate an additional two students per year will come from a military background. The existing M.S. in Explosives Engineering has exceeded all expectations and initial estimates. The projections stated here for the M.S. in Explosives Technology are similarly conservative numbers as we think there is even more potential for attracting technology students.

1. Introduction

Explosives technology refers to the application of explosives in scientific endeavors, and the science and technology of explosives, including their formulation, physics, effects and use. The United States is the largest consumer of explosives in the world, with US civilian sales estimated at 3.1 million metric tons in 2014. (1) This is principally because the United States also has the largest mining industry in the world.

The major use of explosives is in the civilian sector. Of this, an estimated 88% is used in the mining industry (for extraction of metals, minerals, fuels and construction materials). 66% of total explosives consumption is used in coal mining to remove rock from above coal seams, principally in the western United States (coal mined using explosives is responsible for over 30% of US electrical power generation). Of the remaining explosives consumption, 9% is used in metal mining. Missouri is the number one producer of lead in the nation (2), (over half of the vehicle batteries in the US use lead from Missouri) and Doe Run, the major mining company in Missouri, estimates that 10% of its current total mining costs come from drilling and blasting. An estimated 11% is used in the civil construction industry for road cuts, tunnels, trenches for utilities, structure basements and grading for large industrial, distribution and retail complexes. 11% is also used for quarrying crushed stone.

Missouri ranks as number eight in the nation in explosives consumption at 91,600 metric tons. This is principally because of crushed stone production, where Missouri ranks number three in production in the nation (3), and lead mining (Missouri has five of the ten lead mines in the nation). All other civilian uses of explosives combined account for 3%, including forestry, oil and gas exploration and production, explosive welding, demolition, etc. Another important segment of explosives use is government, which includes the Department of Energy (DOE), the Department of Homeland Security (DHS), the Department of Defense (DOD) and the National Laboratories.

The history of explosives at Missouri S&T goes back to its inception as the Missouri School of Mines (MSM). The use of explosives since the invention of dynamite by Alfred Nobel (of Nobel Prize fame) has been a fundamental cornerstone of the mining and civil excavation industries for the excavation of rock. Over the years, MSM/University of Missouri-Rolla/Missouri S&T has been one of the principal universities both in teaching explosives classes and performing explosives research. Over the last decade, it has emerged as the number one university for explosives education at the undergraduate level in the nation. In 1997 it was the first to have an undergraduate explosives engineering emphasis, followed in 2005 by an explosives minor for both undergraduate and graduate degrees, and in 2007 by an explosives engineering certificate and in 2012 by an explosives technology certificate. A master's degree in explosives engineering, which was approved in 2010, was the natural progression and the phenomenal success of the M.S. program and the demand of its graduates for a Ph.D. in explosives engineering led to a Ph.D. degree being approved in 2014.

The success of the explosives program at S&T has led to an increase in explosives faculty positions. A third faculty member (Dr. Catherine Johnson) was hired in January

2015. Dr. Jason Baird retired in August 2015 and was replaced by Dr. Kyle Perry in August 2016. With the addition of Dr. Braden Lusk as chair of the Department of Mining and Nuclear Engineering in August 2016, there is now a core number of four full time explosives faculty positions supplemented by two adjunct professors and several specialty instructors.

The success of the current graduate programs has led to a request to implement this proposal. The ATF, which currently sends 30-40 agents per year through our Explosives Technology Certificate program has requested that we develop a Masters of Explosives Technology degree. Most of the ATF agents do not have the engineering or physical science degree required for an MS in Explosives Engineering. The existing explosives courses offered by Missouri S&T will fit the proposed program, along with three new courses that have been requested by the ATF and have recently been approved by the S&T campus.

The new program will open up opportunities for graduate students with majors other than engineering and physical science disciplines and will increase the diversification of majors compared to our present situation. We receive a constant stream of enquires about our current program but options are still limited for prospective students without an engineering or physical science degree. The Graduate Certificate in Explosives Technology was developed in response to the demand from these students. However, in order to continue on to the M.S. in Explosives Engineering, a series of prerequisite courses are required for most of these students. An M.S. in Explosives Technology would allow such students (who are mostly military) and ATF students to continue on.

This will be the first M.S. in Explosives Technology in North America, and because of this, there are no statistics on the employment of graduates. As far as we know, nearly all of the graduates from the Explosives Engineering M.S. program, apart from the five that went on to full-time Ph.D. study, have immediately obtained jobs on graduation. In some cases, companies were prepared to wait a year after the job offer and in others the students started work and switched to part-time study to finish their M.S. Table 1 shows where the M.S. graduates found employment. It is anticipated that the Explosives Technology graduates will follow a similar employment pattern, with less graduates going into mining and construction.

Table 1: Employment of M.S. in Explosives Engineering Graduates

Consulting Company	2
Explosives Company	11
Armed Services	11
Mining Industry	11
Construction Company	4
Research Company	2
Government / Lab.	8
Ph.D.	5
Own Company	3

Dr. Paul N. Worsley, the current Associate Chair of Explosives Engineering in the Department of Mining and Nuclear Engineering at Missouri S&T, with the assistance of Dr. Kyle Perry will be responsible for the M.S. in Explosives Technology program along with the M.S. in Explosives Engineering, Ph.D. and various minors and certificates. No additional administrative position costs are anticipated.

2. Fit With University Mission and Other Academic Programs

2.A. Alignment With Mission and Goals

Mission Statement: “Missouri S&T integrates education, research and application to create and convey knowledge that serves our state and helps solve the world’s greatest challenges.” A M.S. in Explosives Technology will serve S&T’s Mission Statement well. The faculty and supporting instructors will be able to convey their wealth of explosives knowledge with students not only from our state, but also our nation. Since a large percentage of students enrolled in this program are expected to be from the ATF, we will be training those agents who are in the field every day battling illegal activities and terrorism.

A Master’s Degree in Explosives Technology falls within the Missouri S&T strategic plan by targeting several themes. Theme 2.5 (using technology to enhance student learning and increase faculty productivity) is addressed by the fact that nearly all the courses will be offered online with video recordings of lectures so courses can be taken without coming to campus. These recorded lectures can be used for subsequent offerings which will allow each professor to offer multiple courses each semester without the time demands of lecturing for each course. This greatly improves the productivity of the faculty member. Theme 3.2 (improve service to existing corporate partners) is the primary purpose of this proposal. The ATF, a current government partner, desires a M.S. degree in Explosives Technology. Finally, Theme 4.1 (comprehensive distance and online education strategy) is addressed through the development of additional explosives technology classes

which will all be offered online. Newly developed courses, as well as existing ones, will be offered online which will yield a broad list of offerings available to distance students.

The explosives engineering program has recently submitted revisions for the Undergraduate and Graduate Explosives Technology Certificate. Each one was systematically approved up through the Provost. This gives our program confidence that the support of the campus, college, and department is present. Dr. Braden Lusk, Chair of the Mining and Nuclear Engineering Department, requested that a proposal for a M.S. in Explosives Technology be submitted. To date, there have been nine Undergraduate and 97 Graduate Certificates in Explosives Technology awarded.

2.B. Duplication and Collaboration Within Campus and Across System

No duplication exists at the UM System, state or national level. As far as we know there is no other M.S. in Explosives Technology in the world. The Mechanical Engineering Department at New Mexico Institute of Technology has an M.S. in Mechanical Engineering with Specialization in Explosives Engineering. One of their graduates, who is in the military, is now in our Ph.D. program and stated that it was very theoretically based and extremely difficult for him to follow some of the classes. Cranfield Institute of Technology in the UK has an M.S. in Explosives Ordnance Engineering and some other military orientated degrees but these would require relocation to the United Kingdom, as there are no online courses.

The M.S. degree in Explosives Technology does not involve collaboration with any external institution or organization, except for the transfer of course work from universities outside the University of Missouri. There is the possibility of cooperation with the Civil Engineering Departments at S&T and the University of Missouri – Columbia on a course or two on the blast resistance of structures, and again we will be looking at cooperation with other institutions and former academics now in industry for further courses in specialized explosives chemistry and other areas not currently covered. Several courses from New Mexico Institute of Technology are approved for transfer and Dr. Vilem Petr has been teaching specialty courses for us at the Colorado School of Mines explosives lab.

3. Business-Related Criteria and Justification

3.A. Market Analysis

3.A.1. Need for Program

We receive a constant stream of enquires about our current programs. However prospective students without an engineering or physical science degree are currently limited in their options. The Graduate Certificate in Explosives Technology was developed in response to the demand from these students. In addition, the ATF currently sends 30-40 agents per year through the Explosives Technology Certificate program. The ATF has recently requested that we make some changes to the Certificate program to accommodate an extra 30-40 agents a year, and also develop a Masters of Explosives Technology degree.

In order to continue on to the current M.S. in Explosives Engineering, a series of makeup/prerequisite courses are required for most of these students. An M.S. in Explosives Technology degree would allow these students (who are mostly military) to

continue on. Currently only a handful of the ATF agents that have received the Explosives Technology Certificate have had an engineering or physical science degree for example.

A similar situation exists in many explosives companies as in the mining industry. With the Korean and Vietnam wars, the defense industry was saturated with engineers, many of whom were in the same age group. The majority of those engineers have now retired, leaving a substantial gap in expertise, especially in the area of explosives. The Department of Mining and Nuclear Engineering at Missouri S&T, having recognized national expertise in the areas of explosives education, training and research, is becoming increasingly approached by defense contractors, DOD installations (such as the U.S. Navy's facility at China Lake, CA) and National Laboratories (such as the Idaho National Laboratory and Lawrence Livermore) for explosives workers. Several of our current M.S. graduates have gone to work at these institutions after graduating.

The U.S. Department of Labor shows 8,100 explosives workers, ordnance handling experts and blasters were employed in 2014. (4) From our experience this is probably a conservative number. These workers were employed by the federal government (19.4%), support activities for mining (19.0%), mining (7.1%), engineering services (6.5%), chemical and allied product merchant wholesalers (manufacturers) (5.9%), specialty trade contractors (4.6%), aerospace product and parts manufacturing (3.1%), agriculture, construction and mining machinery manufacturing (2.1%), management, scientific and technical consulting services (2.0%), management of companies and enterprises (1.2%) and research and development (0.7%) for example. The Bureau of Labor Statistics estimates that although demand in the federal government, mining and aerospace sectors will decrease by 2024, the overall demand for explosives workers, ordnance handling experts and blasters will increase by 3.9%. Notable increases of 16.1% in support activities for mining, 11.7% in engineering services, 9.1% in specialty trade contractors, 27.5% in management, scientific and technical consulting services and 6.9 % in research and development are all areas where graduates of the program would find employment.

Missouri S&T is located about 30 miles from Fort Leonard Wood, and has a Memorandum of Understanding with the US Army Engineer School there for military officers to complete an M.S. degree in conjunction with their Engineer Captain Career Course. This MOU is in the process of being amended to include an explosives certificate program that will allow commissioned officers and enlisted personnel stationed at Fort Leonard Wood the opportunity to complete a certificate in explosives engineering or explosives technology. Many of the enquires we receive for the current M.S. program are from military personnel stationed at Fort Leonard Wood and are ineligible due to their non-engineering background. The M.S. in Explosives Technology will fulfill their need.

Mr. Steve Tupper, the S&T Fort Leonard Wood Liaison Officer, has written the following comment concerning Fort Leonard Wood (the major army training base in Missouri and the home of the Army Engineer Center and Maneuver Support Center).

“A training cadre mix of officers and noncommissioned officers do the instruction and are interested in more advanced explosive theory, practice and design. Our current program offerings with an MS Explosives Engineering has been welcomed by them and lead to an

expansion with permission to conduct an undergraduate certificate at the Fort. It appears that an MS Explosives Technology degree offering would make the offering accessible to even more soldiers.”

Our proposed M.S. in Explosives Technology would make the program more accessible to the military. It has strong support from a wide spectrum of our field. The support from our constituents illustrates the need for qualified professionals within the various applications of explosives, the uniqueness of our proposed program, the endorsement of our ability to successfully implement the program, the quality of education that we currently provide, and the keen interest in our program by prospective candidates. Multiple letters of support from each of our constituencies are provided in Appendix A.

3.A.2. Student Demand for Program

The M.S. degree in Explosives Engineering, which was approved in 2010, has been extremely successful. The first year of the program was actually 2010-2011 rather than the originally projected 2009-2010, but as can be seen from Tables 3.A.2.1. and 3.A.2.2, student numbers have far exceeded the projected numbers.

Table 3.A.2.1: Expected Enrollment Potential from Year 1 through Year 5 - from MS in Explosives Engineering Proposal

Year (A/C)	1 (09-10)	2 (10-11)	3 (11-12)	4 (12-13)	5 (13-14)
Full Time	5	6	8	10	12
Part Time	-	5	8	12	15
Total	5	11	16	22	27

Table 3.A.2.2: Actual MS in Explosives Engineering Enrollment from Year 1 through Year 5

Year (A/C)	1 (10-11)	2 (11-12)	3 (12-13)	4 (13-14)	5 (14-15)
Full Time	14	13	15	14	14
Part Time	8	14	12	14	14
Total	22	27	27	28	28

The projected student numbers for year four of the program were actually reached in the first year, and the projected numbers for year five were reached in year two and sustained in year three and subsequent years. In addition, the expected rate of graduation of five students per year was reached in the second year of the program, as can be seen from Table 3.A.2.3. The full- and part-time division we have found to vary. We have students lured to top paying industry jobs who have switched to part time and part-time students who have switched to full time.

Table 3.A.2.3: Actual MS in Explosives Engineering Graduates from Year 1 to Year 6

Year (A/C)	1 (10-11)	2 (11-12)	3 (12-13)	4 (13-14)	5 (14-15)	6 (15-16)
Full Time	4	4	4	10	7	13
Part Time	-	1	1	3	4	3
Total	4	5	5	13	11	16

We expect that the M.S. in Explosives Technology will be just as successful. The enrollment forecasts are considered to be conservative.

Table 3.A.2.4 Student Enrollment Projections (anticipated total number of students enrolled in program during the fall semester of given year).

Year	1	2	3	4	5
Full-Time	0	2	5	6	7
Part-Time	5	10	15	20	20
Total	5	12	20	26	27

Table 3.A.2.4 contains the expected enrollment forecasts from year 1 (2018-2019) to year 5 (2022-2023). These projections are based on the ATF, which has indicated that they would have five students joining the program per year, plus additional students joining the program as they find out about it. For this reason, the program is anticipated to have more part-time (distance) students than full time (on campus) students. The current M.S. in Explosives Engineering caters for most full-time students, the predicted full time students are expected to come from the Engineer Captain's Career Course at Fort Leonard Wood. The predictions include a maximum of 20 part-time students.

Table 3.A.2.5. Student Enrollment Projections (anticipated number of students enrolled during the fall semester of given year who were new to campus).

Year	1	2	3	4	5
Full-Time	0	2	5	6	7
Part-Time	5	10	15	20	20
Total	5	12	20	26	27

Because the current M.S. in Explosives Engineering caters for most full-time students and many part-time students, it is anticipated that practically all of the M.S. in Explosives Technology students will be new to campus. The degree will not take students away from the current M.S. or from other departments.

Table 3.A.2.6 shows the expected number of M.S. in Explosives Technology graduates per year for the first ten years of the program. Based on the projected enrollment, it is expected that this number will ramp up to ten in year five and remain relatively constant after that. Again, this is a conservative estimate.

Table 3.A.2.6. Projected Number of Degrees Awarded

Year	1	2	3	4	5	6	7	8	9	10
# of Degrees Awarded	-	2	5	8	10	10	10	10	10	10

3.B. Financial Projections

3.B.1. Additional Resources Needed

The majority of resources to complete development and implementation of the new M.S. program already exist at S&T. The Mining and Nuclear Engineering Department already offers all of the needed courses and existing faculty members have the training, experience and skills required. The infrastructure is already in place for the mining program to accommodate the increase in enrollment (including one GO administrative assistant and two soft-money secretaries). Therefore, the initial implementation of the program will be at minimal cost. By cooperating with other institutions and through the use of adjunct instructors we feel that this M.S. program will be viable with the current staffing levels (that now include four tenured/tenure track faculty (one of which is Chair of the MNE dept.), two adjunct faculty and three M.S.-graduate instructors), and additional costs will actually be limited to supervising and materials for the extra students (materials are currently donated and we expect this to continue).

Some extra faculty time will obviously be tied up and we intend to trade this out by assigning more duties to GTAs to relieve teaching and grading responsibilities of faculty. As a result, we are budgeting for a 50% GTA appointment (\$24,638 in Year 1) as well as a build up to 15% of three faculty members beginning in year three (5% Year 3, 10% Year 4, 15% Year 5). In years one and two, with the anticipation of a gradual build-up of students in the program, the additional 5 students in year one and 12 students in year two should be manageable and not require any additional sections of courses. The first two years will bolster and fill already offered courses and help reach the course capacity. In subsequent years, the addition of a new faculty member in year three will be necessary.

Because of the high numbers of students already taking some of the explosives engineering courses and the anticipated enrollment of additional M.S. students from this program, it is anticipated that one 1.0 FTE GTA position (broken down into 4 x 25% positions) will be required to assist faculty members with the explosives course load from the beginning. Fifty percent of this position was assigned to the M.S. in Explosives Technology budget, the other 50% would be applied to other students (mining undergraduates, other graduate students and students in other departments) taking the same courses. From Year 2, \$10,000 has been included for mining program expenditures for support of the extra M.S. student numbers (for example, secretarial, printing, advertising, communications, supplies, etc.).

Once student enrollment has increased to the level anticipated by the third-year projections, the current faculty members will be unable to cope with the course load and their time distribution will need to be augmented. Lab courses are difficult to teach with

more than 15 students per lab and we already teach three lab sections of Exp Eng 5612 and two lab sections of Exp Eng 5622. At this point, it is anticipated that an additional faculty member at the assistant or associate professor level will be required at an estimated cost of \$80,000 per year plus benefits (at current levels)¹. The faculty member is budgeted for 50% effort in Year 3, and 75% in Years 4 and 5. A one-time expenditure of \$60,000 is set aside in Year 2 for a start-up package for this faculty member. From prior experience with M.S. and Ph.D. Explosives Engineering proposal submission, it is likely that the new faculty hire may not begin until the third or fourth year. For example, in the M.S. in Explosives Engineering proposal, the budget included a new faculty member to begin in year three. However, it took 3.5 years to get approval for the position and Dr. Johnson did not begin until the middle of the 5th year. We acknowledge that the position availability will depend on the economic health of both S&T and the UM System at the time we are ready for a new hire, but we feel the program will be able to financially support the new hire.

Blank values (\$0 values) in expenses are for several items. No new spaces, equipment, library needs, nor consultants are necessary to implement the program. The program already has access to McNutt hall and the experimental mine which has office space, laboratories, and equipment readily available or can be made available for the new faculty member in year 3.

3.B.2. Revenue

All revenue will come from student fees. The standard Financial Projection Spreadsheet template includes a 52% out-of-state graduate student discount rate which we do not feel is a true representation of the actual revenue that will be generated as all our students will be non-residents and we are using the most current rates and fees. Therefore, Table 2 has been created that has the same expenses, but with more realistic expectations of revenues (all non-resident tuition rate). The budgeted revenues are based on full time students taking 12 hours per semester and 6 hours in the summer and out of state students paying out of state tuition. This would allow the military (or companies) to send employees for one year for them to complete their master's degree. Part time students such as the ATF usually take two courses per year and pay the distance course fees. The ATF has negotiated a slightly lower rate for their student fees with S&T, \$1,111 per credit hour vs. the \$1,200 standard rate. The budget is based on these assumptions and the Summer 2017 and Spring 2018 tuition rates, the most current at submission of this proposal. Tuition, IT fee, and Engineering & Science course fees are included while the activity and health service fees are omitted.

The revenue is based on the anticipated enrollment of:

- Year 1: 0 full time, 5 part time
- Year 2: 2 full time, 10 part time
- Year 3: 5 full time, 15 part time

¹ All financial information is based on 16 -17 costs. All revenue and expenditures are based on figures for this year.

Year 4: 6 full time, 20 part time
Year 5: 7 full time, 20 part time

3.B.3. Net Revenue

Using what we feel as more realistic values as shown in Table 2, expected revenue is anticipated to exceed expenses in each of the first five years, including the first year. By just including the five distance students which the ATF has already committed to send and limited expenses to accommodate those five students, the first year results in a positive net revenue value of \$8,688. As additional students join the program, tuition/fee revenue increases drastically over expenses in year two. This will allow for a large sum of money to be set aside as the start-up package for the anticipated faculty member add in year three. Net revenue increases in year three even with the addition of a new faculty member at 50% effort. As the program reaches the anticipated enrollment and with an additional explosives faculty member, we expect an annual positive net revenue of approximately \$240,000.

The revenue break-even point occurs in year one and cumulative revenue over 5 years is \$721,195, even with the addition of an \$80,000/year faculty member (at 75% effort toward this program), including benefits and a \$60,000 startup account.

3.B.4. Financial and Academic Viability

To be financially viable, 11 part-time and 5 full-time students will be necessary. This assumes that a new faculty member has been hired (at 75% effort) and the other three full time faculty members are committing 15% of their time to the program.

To be academically viable, one student is required. Since this Explosives Technology program will run in parallel with the established, strong Explosives Engineering program, the courses required will already be offered. Therefore, if we can add even one student to the explosives student population, that student will be served and additional revenue will be seen by S&T.

**Table 2. Financial Projections for Proposed Program for Years 1 Through 5.
Based upon most up-to-date non-resident tuition and fee rates.**

	Year 1	Year 2	Year 3	Year 4	Year 5
1. Expenses per year					
A. One-time					
<i>New/Renovated Space</i>					
<i>Equipment</i>					
<i>Library</i>					
<i>Consultants</i>					
<i>Other (new faculty startup)</i>		\$60,000			
<i>Other (Mining E&E)</i>		\$10,000	\$10,000	\$10,000	\$10,000
Total one-time	\$0	\$70,000	\$10,000	\$10,000	\$10,000
B. Recurring					
<i>Faculty</i>			\$54,752	\$91,295	\$108,469
<i>Staff</i>	\$24,638	\$24,884	\$25,133	\$25,385	\$25,638
<i>Benefits (32%)</i>			\$19,400	\$32,300	\$38,400
<i>Equipment</i>					
<i>Library</i>					
Total recurring	\$24,638	\$24,884	\$99,285	\$148,980	\$172,507
Total Expenses (A+B)	\$24,638	\$94,884	\$109,285	\$158,980	\$182,507
2. Revenue per year					
<i>Tuition/Fees</i>	\$33,326	\$149,145	\$306,209	\$380,781	\$422,028
<i>Institutional Resources</i>					
<i>State Aid--CBHE</i>					
<i>State Aid--Other</i>					
Total revenue	\$33,326	\$149,145	\$306,209	\$380,781	\$422,028
3. Net revenue (loss) per year	\$8,688	\$54,261	\$196,924	\$221,801	\$239,521
4. Cumulative revenue (loss)	\$8,688	\$62,949	\$259,873	\$481,674	\$721,195

Table 3. Enrollment at the End of Year 5 for the Program to Be Financially and Academically Viable (based upon Table 2 revenue estimates).

Enrollment Status	Full-Time	Part-Time	Total
Financially # of Students	3	10	13
Academically # of students	0	1	1

3.C. Business and Marketing Plan: Recruiting and Retaining Students

Target recruitment audiences for the Explosives Technology M.S. will include professionals currently employed in industry, the military and other government agencies, especially the ATF. The overarching recruitment goal is to obtain a highly-qualified student body that is diverse across traditional/non-traditional student categories, discipline area, age, gender, and ethnicity. Recruitment methods will serve to educate the students about the field, but also challenge students to cross interdisciplinary fields and gain interdisciplinary exposure. The current system for recruiting for the mining B.S., explosives minor, M.S. and Ph.D. and mining distance education will be utilized. The mining program support staff, Shirley Hall and Judy Russell, will provide the pertinent informative literature on the Explosives Technology M.S. and the department at S&T. They will channel inquires to the appropriate faculty member.

The recruitment methods for both traditional students and non- traditional industry graduates will include:

- Replies to e-mail correspondence (the majority of current enquiries are e-mail)
- Direct mail involving invitations and brochures of the program to interested individuals
- Include explosive program information on mining program literature
- Degree-specific website that includes web-based services
- Paragraphs about and links to the explosives program on collaborating academic units' websites
- A continuation of broad-based media exposure - newspapers, TV and new media
- Referrals from the International Society of Explosives Engineers

A military demolition course has been developed in conjunction with Fort Leonard Wood. Together with the Fort Leonard Wood MOU, this will add significant (military) value to their existing army course and provide an attractive enticement for army officers without engineering or physical science degrees to come in to the M.S. in Explosives Technology program. These officers represent a significant pool for quality graduate students for the university in the form of distance classes as well as on site classes. It is the intention in the long run to recruit M.S. students from the lieutenant class and for them to take a large proportion of their classes distance before returning for the Captain's Career

Course, as well as taking classes in conjunction with their Captain's Career Course at the Fort.

The demand for the program is expected to increase after the recruitment plan is implemented, as student and industry awareness of the program increases. Based on our experience in recruiting students for the M.S. in Explosives Engineering program, the recruitment plan will be comprehensive and use multiple proven methods to reach both traditional and non- traditional students.

Marketing costs will be shared with the costs of marketing the M.S. in Explosives Engineering and other explosives programs. To date, there have been very little marketing costs beyond the printing of brochures, as everything else has been by word of mouth.

Student retention is already a priority in the department and each student is assigned an academic advisor who tracks their progress, with considerable assistance from the support staff. The faculty advisors will guide students through course selection, monitor their progress towards completing graduation requirements, and provide information and advice on post-graduation employment. Students will also be advised and encouraged to utilize the many academic and career support services offered by both the department and Career Opportunities and Employee Relations at S&T. The resources available at S&T and individual faculty member advising already attracts and retains students and we plan to continue utilizing these to ensure program enrollment outcomes are achieved.

4. Institutional Capacity

Missouri S&T is particularly well suited and equipped to support an M.S. degree program in Explosives Technology to be offered by the Department of Mining and Nuclear Engineering. Key factors include the strength of the Department of Mining and Nuclear Engineering, the nature of Missouri S&T as a technological research university and opportunities for research, internships, and co-ops.

Department of Mining and Nuclear Engineering

The degree will be an integral part of the Department of Mining and Nuclear Engineering at Missouri S&T but the students will be counted as explosives program graduate students. The strengths of both mining and explosives are augmented using this symbiotic relationship. The department has several years of experience developing and teaching courses in explosives as part of its minor, certificate and M.S. in Explosives Engineering. It has capitalized on this long history of teaching and research in the explosives field in recent years, increasing its course offerings and rebuilding its faculty in this area such that a core program is now possible. Because Missouri S&T is a research university, the faculty have a strong tradition of research, teaching and service.

Missouri S&T as Missouri's Technological University

Missouri S&T's strong reputation as the state's technological research university and as one of the top providers of M.S. and Ph.D. graduates in engineering and science

in the country, and its reputation and tradition in this field make it the logical home for an explosives program. There are now eighteen separate explosives related courses totaling 54 credit hours available (excluding research, and special problems courses): Exp Eng 5112, Exp Eng 5512, Exp Eng 5513, Exp Eng 5514, Exp Eng 5555, Exp Eng 5612, Exp Eng 5622, Exp Eng 5713, Exp Eng 5922, Exp Eng 6001 (two separate new classes), Exp Eng 6070/6080, Exp Eng 6112, Exp Eng 6212, Exp Eng 6312, Exp Eng 6412, Exp Eng 6464, Exp Eng 6292. In addition, three new classes are being developed for the Certificate in Explosives Technology, as requested by the ATF, and new courses will be developed as opportunity presents. Three courses are currently only taught on campus, all other courses are taught distance concurrently with the on-campus classes. The mining program has a bulk thumb drive copier to facilitate the distribution of course material for distance courses.

The current facilities can accommodate the explosives courses, the main need for the new program being extra personnel in the form of adjunct instructors and graduate student assistants. Since the implementation of the M.S. in Explosives Engineering a couple of courses have been taught by GTAs under faculty supervision to lighten the load on current faculty and the availability of Ph.D. students (since 2014) should allow this to increase. In conjunction with industry instructors we have now reached a sustainable level where students can obtain a degree in explosives with a degree of flexibility of course selection within the explosives classes offered at Missouri S&T.

Facilities and Space Needs

Current facilities will accommodate the Explosives Technology M.S. students. These facilities include modern lecture facilities at McNutt Hall equipped with an instructor station (which includes a computer and a ceiling-mounted LCD projector) linked to the campus network through a high-speed data network, the Missouri S&T experimental mine and the energetic materials research facility.

Underground Mine Facility: The Missouri S&T Experimental Mine is one of only a few such facilities available on a university campus for mining engineering education. The facility is used primarily by the students and faculty of Missouri S&T for instruction and research in mining and geological engineering practices. The Experimental Mine is located on Bridge School Road, just west of Rolla, 1-1/2 miles from the Missouri S&T Campus. It consists of two underground mines, two small quarries, explosives magazines, a classroom and office facility, a shop building, and a garage on a 19-acre site. A brand new, 15,000 square foot classroom building will open in 2017 on the mine site. In addition to offices for faculty and graduate students, this building has three classrooms equipped with instructor podiums and ceiling-mounted projectors linked to the campus network through a building-wide high-speed data network, a computer lab, a conference room, two labs, a dirty classroom for instruction of practical classes, changing facilities and a mine rescue station. The three classrooms open up into one large facility. The underground mine facility is already extensively used for explosives classes and research and the addition of the new building will ease the strain on the current classroom and office space.

Surface Quarry Facility: The Missouri S&T Experimental Mine also includes two small surface quarries used for teaching and research by mining engineering faculty and students. These quarries are already extensively used - for explosives classes, research and demonstrations, as well as explosives camp in the summer.

Energetic Materials Research Facility: A brand new Energetic Materials Research Facility (Explosives Research Lab) laboratory is housed in a purpose-built building at the Rock Mechanics and Explosives Research Center. The laboratory contains two blasting chambers (rated for 1 kg and 4 kg of explosives, respectively), a shop, a computing workstation running Autodyn 3D© software (an industry standard for performing closely-coupled computational fluid dynamics/computational structural dynamics calculations), high-speed film (up to 1.25 M frames per second) and video cameras (up to 90k frames per second), gated ICCD camera (up to 55 nanosecond exposure), flash x-ray system, 16-channel digital data acquisition system, three high-energy pulsers, two delay generators, two initiation systems for exploding bridgewire detonators, and explosive magazines. The laboratory is currently used for teaching Exp Eng 6312, the instrumentation course. The 11 ft diameter large scale blast chamber was acquired from the Army Chemical Demilitarization Command in Tooele, Utah. This chamber is 84 tons and represents a major upgrade to the facility, raising the facility to the realm of world-class capabilities.

Facilities at Industry Operations: Field trips to operating mines have been used intensively to demonstrate real-world mining facilities, especially for rock blasting, the major use of explosives. In the past, many explosive research projects have involved industry participation for both funded faculty, undergraduate and graduate research. It is expected that these links will continue.

5. Program Characteristics

5.A. Program Outcomes

Learning outcomes for the program include the following specific skills:

- Understanding and application of the functioning of explosives and initiation systems.
- Understanding and application of explosion effects.
- Understanding and application of safety as applied to explosives in field use, testing and demonstration environments.
- Experience with the safe handling of energetic materials.
- Understanding of the application of explosives for fragmenting rock and other materials.
- Expertise in focused professional areas such as demolition, blast resistance, rock breakage or weapons systems design, loading and production.
- Understanding of the challenges of using explosives and environmental impact.

Graduates will have training in explosives technology from a program that is unique the world. Graduates will be able to go into management for companies with the knowledge and background to be successful. Existing management and financial personnel (accountants) from various industries (commercial, industrial, government, etc.) will find the Explosives Technology M.S. useful when making decisions that may affect explosives use or purchasing.

5.B. Structure

The proposed M.S. degree in Explosive Technology will meet or exceed the general requirements listed in the Missouri S&T Graduate Catalogue. The individual candidate's program will vary according to their interests. With guidance from their advisor, each candidate will complete a plan of study to satisfy their interests and their advisor, plus requirements for the Master of Science degree, as described in the Missouri S&T Graduate Catalog. 30 credit hours will be required for graduation with 12 hours or 4 courses specific to the degree, selected from a list of core courses. The remaining 18 hours will be technical electives chosen from Exp Eng courses and related out of department courses. Whilst a thesis is not required, a candidate may choose to take six hours of research and complete a thesis.

PROGRAM STRUCTURE

1. Total credits required for graduation: 30 hours

2. Residency requirements, if any: none

3. General education - N/A

Total credits for general education courses:

Courses (specific course or distribution area and credit hours):

Course	Hrs	Course	Hrs	Course	Hrs

4. Major requirements

Total credits specific to degree: 12 hours – 4 of the following core classes:

Courses (specific course or distribution area and credit hours):

Course	Hrs	Course	Hrs	Course	Hrs
Exp Eng 5612	3	Exp Eng 5922	3		
Exp Eng 5622	3	Exp Eng 6112	3		
Exp Eng 5711	3				
Exp Eng 5713	3				
Exp Eng 5721	3				
Exp Eng 5914	3				

5. Technical elective credits

Total technical elective credits: 18 hours of technical electives chosen from Explosives Engineering courses and related out of department courses.

The sum of hours required for general education, major requirements and free electives should equal the total credits required for graduation.

6. Requirement for thesis, internship or other capstone experience:

Candidates may choose to include 6 hours of research with thesis in their free elective credits but this is not required.

7. Any unique features such as interdepartmental cooperation:

New Courses: There are currently 18 explosives engineering classes available plus research and an agreement with New Mexico Institute of Technology to allow three of their online explosives classes (up to 9 credit hours) to be transferred in for

credit. Oklahoma State University offers a certificate in Forensic Science which can be transferred in to count for up to 9 credit hours upon approval by the Explosives Engineering Associate Chair. In addition, three new classes have been approved (SP2017) and are being developed for the Explosives Technology programs as requested by the ATF (starting implementation FS2017) and new courses will be developed as opportunity presents.

Exp Eng 5612 Principles of Explosives Engineering

Exp Eng 5622 Blasting Design and Technology

Exp Eng 5711 Explosives in Industry

Exp Eng 5713 Demolition of Buildings and Structures

Exp Eng 5721 Specialty Uses of Energetic Materials

Exp Eng 5914 Explosives Manufacturing

Exp Eng 5922 Tunneling and Underground Construction Techniques

Exp Eng 6112 Explosives Regulations

Descriptions of the above courses can be found in Appendix C.

5.C. Program Design and Content

The M.S. in Explosive Technology has been designed to complement the existing M.S. in Explosives Engineering, to allow graduates without a B.S. degree in Engineering or Physical Science with an interest in explosives to obtain an M.S. degree. Most of the ATF agents currently enrolled for the Graduate Certificate in Explosives Technology, for example, fit this population.

The sequence of explosive courses is included in Appendix B. Appendix C contains the Graduate Catalog Description of the explosives engineering program at Missouri S&T, including course syllabi descriptions and learning outcomes.

5.D. Program Goals and Assessment

- Learning outcomes will be assessed by the GPA of the students and, when applicable, the passing rate of blasting license exams.
- The only applicable tests are state explosives licensing tests. More than 80% of the students are expected to score above the 50th percentile on these tests. (Based on past performance of students. Source: Dr. Worsey, state certification program examiner 1990-2008.)
- The goal for retention and graduation rates is that 80% of the students who begin in the program are retained and graduate. This is based on past experience of distance students. We lose a few that begin, mainly due to work and family commitments.
- Number of graduates per annum at three years after implementation: 5
Number of graduates per annum at five years after implementation: 10
- Graduates will become members of the International Society of Explosives Engineers and other professional organizations, as appropriate. At present there are no professional groups licensing graduates from explosives programs. All licensing is at the state level, which comprises a) blaster's licensing (which may be at multiple levels depending on the state, b) display fireworks operator licensing and c) pyrotechnician and special effects licensing. It is anticipated that the majority of graduates will obtain licensing in at least one of these areas.
- There will continue to be growing opportunities for explosives technology graduates in the defense, mining and civil construction industries and in government institutions. Since the majority are expected to be distance students with jobs in these fields, we expect 100% of our graduates to be employed.

5.E. Student Preparation

- Students will be required to meet the standard graduate school admission requirements for the M.S. degree at the Missouri University of Science and Technology and hold a bachelor's degree.
- U.S. law requires citizenship or permanent residence and in addition has several prohibited categories for explosives handling (see Section 6).

5.F. Faculty and Administration

Dr. Paul N. Worsley, Associate Chair of Explosives Engineering, in the Department of Mining and Nuclear Engineering at Missouri S&T will be responsible for this program along with the existing M.S. in Explosives Engineering, Ph.D. and the various minors and certificates. He will be assisted by Dr. Kyle Perry, who will take over from Dr. Worsley when he retires in a few years. It is anticipated that 15% of their time will be dedicated to the degree after five years.

Faculty involved in the program are based around existing faculty from the Department of Mining and Nuclear Engineering at Missouri S&T and instructors from industry currently employed on a flat rate to co-teach explosives classes. Faculty from New Mexico Institute of Technology currently teach courses approved to transfer in to S&T and faculty from Colorado School of Mines teach distance classes at their explosives laboratory.

Faculty Currently Teaching Courses

Professor

Paul Worsley, Ph.D., University of Newcastle upon Tyne (S&T) (15%)

Braden Lusk, Ph.D., University of Missouri Rolla (S&T) (S&T) (5%)

Associate Professor

Jason Baird, Ph.D., University of Missouri Rolla (Emeritus) (Missouri S&T) (5%)

Vilem Petr, Ph.D., Colorado School of Mines (CSM) (CSM) (5%)

Assistant Professor

Kyle Perry, Ph.D., University of Kentucky (Missouri S&T) (15%)

Catherine Johnson, Ph.D., University of Kentucky (Missouri S&T) (15%)

Gillian Worsley, Ph.D., University of Missouri-Rolla (Adj) (Missouri S&T) (10%)

Soekbin Lim, Ph.D., University of Missouri-Rolla (S&T)(NMIT) (5%)

Adjunct Industry Instructors Currently Teaching Courses at Missouri S&T

Matt Suttcliffe (Premier Pyrotechnics) (5%)

Matthew Coy, M.S., Missouri S&T (Missouri S&T) (5%)

Stephen Hall, M.S., Missouri S&T Hercules (Retired) (5%)

Jerry Vail, M.S., Missouri S&T (Missouri S&T) (10%)

We hope to broaden the scope of the program to involve professors from other disciplines on campus as the offering of courses expands. Some examples would be explosives chemistry, history of explosives, and shock wave physics, in addition to cooperation with the civil engineering department on blast resistance.

This program will be supported with a combination of existing Missouri S&T regular faculty and adjunct industry instructors who will have a background and experience in explosives relevant to the subject matter being taught, and bring specialized and practical experience to the courses they will teach. Faculty from other academic institutions may also teach additional courses. This would leverage what we have and allow us to provide more complete and varied course offerings. The academic faculty are expected to hold a Ph.D. or its equivalent in their area of specialty.

The estimated percentage of credit hours that will be assigned to full-time faculty: 80%.

Faculty at Missouri S&T are expected to participate in teaching, research, service and outreach activities. Annual reviews, promotion and tenure, continuing membership on the graduate faculty and annual salary adjustments ensure the quality of faculty activities. The faculty of the explosives engineering program will be located in the Department of Mining and Nuclear Engineering. The name of the department will remain to reflect its undergraduate offerings. The tenure and promotion of the explosives faculty will continue to reside for the foreseeable future with the mining engineering program.

5.G. Alumni and Employer Survey

Missouri S&T will develop an assessment and evaluation plan for the curriculum in explosives technology based on the ABET-accredited B.S. program in mining engineering. This will be developed after the M.S. in Explosives Technology is approved. We expect a 90% satisfaction rate of the alumni of the program (based on experience from our mining graduates.) Surveys will be performed annually and given to those who earned their degree in that respective academic year. The surveys will be web based.

Graduates will be tracked and Missouri S&T will develop an assessment and evaluation plan for gathering information by surveying the employers of the graduates after the program has graduated at least 5 persons. We expect 90% satisfaction from the employers. (Based on experience from mining program surveys.) Surveys will be performed annually and sent to the supervisor of the graduate who earned their degree in that respective academic year. The surveys will be web based.

5.H. Program Accreditation

There is no accreditation for graduate programs in the explosives field. It is expected that the students will have bachelor's degrees from already accredited programs.

6. Security Considerations

The importance of explosives education is vital to civilian industry, government and the defense industry, yet explosives knowledge, like that from the majority of other technical disciplines, can also be used against society. Since the terrorist attacks on September 11, 2001, U.S. academic institutions have come under increasing scrutiny. The Safe Explosives Act of 2003 expanded the number of categories of persons banned from possessing explosives to include non-U.S. residents, those with dishonorable discharges from the military and those who have renounced their citizenship. This is in addition to felons, fugitives from justice and those who have been declared mentally defective. Not only is it illegal for these groups of people to have access to explosives but it is illegal for institutions to provide such persons with explosives without first obtaining a waiver from the U.S. Bureau of Alcohol, Tobacco, Firearms and Explosives.

The Safe Explosives Act requires background checks for users of explosives and so each prospective student will require a completed background check. Proof of an existing background check, such as holding a state blaster's license or CDL with Hazmat endorsement, being a current member of law enforcement, military, appropriate government agency or national lab or holding a security clearance will be accepted. Otherwise a prospective student will have to pay for and undergo a highway patrol background check. This needs to be done before acceptance into the program as an entrance requirement.

Global Learning, strongly supports the teaching of explosives courses by distance to bona fide individuals and organizations, realizing that a degree of determination of the authenticity of these groups is necessary. Distance education is becoming increasingly important, especially to degreed professionals already entrenched in the work environment who are unable because of work or family commitments and/or financial consequences to pursue conventional higher education in specialist fields. Note: in order to actually handle explosives a student would need to study on campus. In addition distance students are vetted so that not just anyone would be enrolled in the program; they would have to be admitted by the registrar first.

7. References

1. Apodaca, L.E. "Explosives" USGS 2014 Minerals Yearbook, U.S. Department of the Interior, May 2016, pp 23.1-23.5.
2. Guberman, D.E. "Lead" USGS 2014 Minerals Yearbook, U.S. Department of the Interior, November 2016, pp 42.1-42.9.
3. Willett, J.C. "Stone, Crushed" USGS 2014 Minerals Yearbook, U.S. Department of the Interior, April 2016, pp 71.1-71.8.
4. Bureau of Labor Statistics "Explosives worker, ordnance handling experts, and blasters" National Employment Matrix 47-5031, U.S. Department of Labor, 2014.

Appendices

Appendix A – Letters of Support for the MS in Explosives Technology Program

Appendix B – Sequence of Current Explosives Engineering Courses at Missouri S&T

Appendix C – Description of Program and Courses

Appendix A

Letters of Support for the MS in Explosives Technology
Program

Appendix A

Letters of Support for the MS in Explosives Technology

Proposed by

Missouri University of Science and Technology

The proposed Master's program is of importance to three different constituents, each with different needs.

The ATF has requested the program be developed, so that their agents can continue on to an M.S. degree once they finish their Explosives Technology Graduate Certificate. They are wanting to encourage their agents to continue on to an M.S. degree. The first four letters are from ATF representatives.

We receive a constant stream of enquires about our current programs from prospective students without an engineering or physical science degree, mostly from military officers, (especially EOD officers from all branches of service), who are currently limited in their options. The next seven letters are from military officers who graduated from an explosives M.S. program and explain the need for an M.S. in Explosives Technology for their military colleagues. In addition there is a letter of support from the S&T Liaison to Fort Leonard Wood.

Lastly there is a need from people in the mining industry who have come into the industry without a degree in engineering or physical science. The last letter explains this need.



U.S. Department of Justice

Bureau of Alcohol, Tobacco,
Firearms and Explosives

Explosives Research and Development Branch

January 17, 2017

www.atf.gov

752110: NDH
3320

Braden T. Lusk, Ph.D
Professor & Department Chair
Department of Mining & Nuclear Engineering
Missouri University of Science and Technology
226 McNutt Hall
1400 N. Bishop
Rolla, MO 65409-0450

Dear Dr. Lusk;

I am writing in support of your proposed Master of Science degree, with a concentration in explosives technology, as a compliment to your graduate certificate.

As you know, ATF regulates the explosives industry and investigates the criminal misuse of explosives. In our efforts, we identified a void in the formal education system that would address our need for explosives specialists with a technical foundation in the physical processes and underlying theory of shockwaves, detonation and initiation, beyond the certificate level.

So far, (70) ATF Special Agent Certified Explosives Specialists (CES's) have earned the graduate certificate in explosives technology. There are also another (65) currently enrolled.

I feel strongly that the proposed program would not only support our objective, but it would fill a void for many professionals who work in the field of explosives but do not possess an undergraduate engineering degree.

I look forward to our continued partnership with MS&T.

Sincerely,

William M. Joa

Chief, Explosives Research and Development Branch



U.S. Department of Justice

Bureau of Alcohol, Tobacco,
Firearms and Explosives

Explosives Enforcement Branch

January 3, 2017

www.atf.gov

752220: NDH
3320

Braden T. Lusk, Ph.D
Professor & Department Chair
Department of Mining & Nuclear Engineering
Missouri University of Science and Technology
226 McNutt Hall
Rolla, MO 65409-0450

Dear Dr. Lusk;

It is my understanding that the MS&T Mining and Nuclear Engineering Department is considering a new program identified as a Master of Science in Explosives Technology. This seems to be a good compliment to your Graduate Certificate in Explosives Technology.

I would like to express my interest and support for this program. In my opinion, there is a need for formal explosives technology education that incorporates solid engineering principles particularly for those who have completed your graduate certificate but lack the requisite science and math, at the undergraduate level.

Therefore, I believe the MS in explosives technology would fill that need.

Sincerely,



Neil D. Harper



U.S. Department of Justice

Bureau of Alcohol, Tobacco,
Firearms and Explosives

Washington, DC 20226

www.atf.gov

750000: SKM
1210

Dr. Braden Lusk
Chair of the Mining and Nuclear Engineering Department
Missouri University of Science and Technology
226 McNutt Hall
1400 N. Bishop
Rolla, MO 65409-0450

Dear Dr. Lusk:

I am very interested the development of the new Masters of Science in Explosives Technology being proposed at Missouri University of Science and Technology. This new degree has the potential to impact a much larger community than the Masters of Science in Explosives Engineering. Most of our Special Agent Certified Explosive Specialists do not hold a degree in science, technology, engineering or math and this new degree would allow them to continue their education and improve their investigative skills.

We truly appreciate the desire of the Mining and Nuclear Engineering Department to advance the knowledge of the explosives engineering community.

Sincerely yours,

S. Kevin McNeill

Chief, Explosives Research and Development Division



U.S. Department of Justice

Bureau of Alcohol, Tobacco,
Firearms and Explosives

Explosives Enforcement Branch

March 1, 2017

www.atf.gov

752220: HAO
3320

Braden T. Lusk, Ph.D
Professor & Department Chair
Department of Mining & Nuclear Engineering
Missouri University of Science and Technology
226 McNutt Hall
1400 N. Bishop
Rolla, MO 65409-0450

Dear Dr. Lusk:

I am writing in support of your proposed Master of Science degree in Explosives Technology as a compliment to your graduate certificate. So far, 77 ATF Special Agent Certified Explosives Specialists (CES's) have earned the graduate certificate in Explosives Technology from MST with another 64 currently enrolled.

As you know, ATF regulates the explosives industry and investigates the criminal misuse of explosives. We've identified a void in the formal education system for our Explosives Specialists in that they need to have a technical and educational foundation in the physical processes and underlying theory of shockwaves, detonation and initiation, beyond the certificate level. I feel that the MS in Explosives Technology would undoubtedly fill this void and further our CES's understanding of explosives function and effects.

I look forward to a continued partnership with MS&T.

Sincerely,

Hugh A. O'Connor
Acting Chief, Explosives Enforcement Branch

1 March 2017

To Whom It May Concern:

I am a Captain in the U.S. Army. My job specialty is Explosive Ordnance Disposal. I have had the opportunity and privilege to pursue a Master's Degree in Explosive Engineering. This has been both a challenging and rewarding degree path. It has complimented and expanded my knowledge of explosives. I am confident in the value that this degree will give me.

There have been many Army officers that have expressed interest in the explosives degree path at MS&T. Unfortunately, the vast majority of them are discouraged by the science and math prerequisites. Many do not have bachelor's degrees in math and science and are intimidated by the requirements. Additionally, the Army provides finite windows for Army officers to attend graduate school. Officers may not know about the prerequisites for the Explosive Engineering degree until it is too late to prepare.

Army officers would benefit greatly if Missouri S&T offered a MS in Explosive Technology that did not require the extensive math and science prerequisites. It is my opinion that the explosives department would get much more enrollment from Army captains at the Engineer Career Course as well as from other Soldiers pursuing an online degree path.

Respectfully,



Mark Wiseman
CPT, OD (EOD)
Explosive Ordnance Disposal Officer
mark.e.wiseman2.mil@mail.mil
markezrawiseman@gmail.com
719-313-3160



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
744TH ORDNANCE COMPANY (EXPLOSIVE ORDNANCE DISPOSAL)
7555 HEADQUARTERS LOOP ROAD
FORT CAMPBELL, KENTUCKY 42223


AFCB-OFB-ZA

12 May 2017

MEMORANDUM FOR RECORD

SUBJECT: Non-Engineer Admission to Explosive Engineering Programs at University of Missouri Science & Technology, Rolla, Missouri

1. I, Christopher J. Weber, have participated in the Explosive Technology Certificate program and the Masters of Science in Explosive Engineering program at Missouri S&T during the 2016-2017 school year. Having graduated with a Bachelor's of Science in Applied Science from Campbell University, Buies Creek, North Carolina, I was not a degreed engineer when I started this program. Acceptance into the Explosives programs through MS&T were contingent upon successfully completing the certificate program with a 3.0 GPA average. Additionally, some prerequisite courses were waived based on the training I received at the Navy School, Explosive Ordnance Disposal, Eglin Air Force Base, Florida, and the three years of on the job training and experience received working within the EOD field.
2. I have successfully completed the required classes for both my certificate and master's degree within one calendar year of starting the program. This was accomplished by taking 3 semester hours during the summer semester, 6 semester hours in the fall semester while also attending Engineer Captains Career Course, and 21 semester hours in the spring semester as part of my participation in the ECCC Professional Development Program.
3. My curriculum background was not math or physics heavy in my undergrad program, but I do not feel like this has hindered me, in any way, to successfully complete this program. In fact, most classes did not utilize more than a basic college algebra or statistics level of math comprehension. There were some exceptions to this in Environmental Controls of Blasting, but the math was easily explainable and understandable. This program is easily understood if the applicant has a good understanding of energetic materials, and has had on the job experience in an explosive field. For the record, the biggest learning curve for myself in this program was understanding the terminology and equipment used for mining and quarrying blasting.
4. I would feel comfortable recommending this program to Army Officers that do not have an Engineering/Science Degree in their undergraduate studies.
5. POC for this memorandum is CPT Weber, Christopher J., phone number: (910)263-3589, or email: Christopher.j.weber16.mil@mail.mil


CHRISTOPHER J. WEBER
CPT, OD (EOD)

17 March 2017

Major Brett A. Carey
816 Admirals Way
Oxon Hill, MD 20745

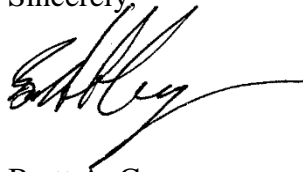
To whom it may concern:

I fully support the proposed Missouri S&T MS in Explosives Technology. I am a Major in the United States Army and currently serve as a Nuclear/Explosive Ordnance Disposal (EOD) Officer; I have worked in the explosives field for over twenty years. I am currently a MST PhD student in the Explosives Engineering program. I have a MS in Mechanical Engineering with a Specialization in Explosives Engineering, but I did not have a math or science bachelors. My path to my Masters is not a normal one and most personnel that work with explosives in the military do not have the hard science, but they have the experience. When I show them how I completed my original program they are apprehensive, which is unfortunate, but a Technology centered degree program would provide them the path to higher education that they currently lack. My upper level learning has been critical to continuing my military career; the Army and I benefitted from the experience and knowledge that these explosive courses offers.

I also believe the MST MS in Explosives Technology program will be of great interest and relevance to the United States Military. I see the benefits for a military student who attends as both a great opportunity to not only to continue their education, but also to contribute to the academic and professional community through research. The proposed program provides a higher education path that directly relates to the Chemical, Biological, Radiological, Nuclear and Explosives (CBRNE) field and Missouri S&T can provide this. As an example, in all of my previous EOD assignments, I worked on different projects that used explosive tools in new ways and this proposed program would relate to those jobs.

I strongly urge you to approve the proposal for this Ph.D. program. Please feel free to contact me at brett.a.carey.mil@mail.mil, brett.a.carey@gmail.com or 301-751-8073.

Sincerely,

A handwritten signature in black ink, appearing to read "Brett A. Carey", with a long horizontal flourish extending to the right.

Brett A. Carey
Major, U.S. Army

E-mail from Lt. Edmund Spivak, U.S. Air Force EOD Officer currently stationed at Eielson Air Force Base in Alaska and December 2016 graduate of the M.S. in Explosives Engineering program.

I will most definitely write a letter and get it to you soon. Since receiving my degree, and higher levels of the Air Force knowing about it, I have been asked to consult on several international projects. I believe that by eliminating the engineering requirement it will open advanced explosives knowledge to all of the DoDs explosive ordnance disposal technicians and drastically improve their understanding of explosive effects.

Respectfully,

Ed

E-mail from Lt. Brian Kirk, U.S. Navy EOD Officer currently stationed in Iraq and December 2016 graduate of the M.S. in Explosives Engineering program:

Hello Dr. Worsey,

I hope all is well. Below is my endorsement of the MS Degree in Explosives Technology program:

I wholeheartedly endorse the Missouri S and T Explosives Engineering Departments push to start a new MS Degree in Explosives Technology. Many of my colleagues in the Navy Explosive Ordnance Disposal (EOD) community are very interested in the MS Explosives Engineering Degree at Missouri S and T. However, most lack the hard science prerequisites necessary to complete the degree. The MS in Explosives Technology will bridge that gap. It will allow my colleagues to study and obtain a recognized degree in Explosives Technology without needing to go back to school to complete prerequisites they don't already have. I recommend the committee approve the MS Degree in Explosives Technology so that it will open the coursework and degree to my colleagues and others who fall into this category.

Cheers,

LT Brian Kirk

Combined Joint Special Operations Task Force - Iraq EOD Officer

107 Crestside Court
Smyrna, TN 37167
615-785-0495
naskopak@gmail.com
February 27, 2017

To Whom It May Concern:

As a recent graduate of the esteemed, master's certificate in explosive technology and master's degree in explosive engineering, program I find it my duty to indulge in matters which could further the establishment as well as the breadth of reach for future students. After spending eight and a half years as a Combat Engineer Officer in the Marine Corps, three years as an Officer Selection Officer in the Marine Corps, and now as a Reserve Engineer Officer in the Army, I have a been exposed to a multitude of college curriculum in relation to their engineer influence.

As a military engineer officer, there is not a strict requirement on the undergraduate degree program, except for certain professional engineer billets that fall outside of the typical mass of engineer officers. Upon selection of becoming an "engineer" officer, we are faced with a multitude of engineering facets which most notably focus on general engineering and demolitions with the expectation of creating subject matter experts. Whether officers choose to further pursue academia to assist them in increasing proficiency within their occupation or not, they typically find they are hindered by unforeseen circumstances when they do.

Military officers coming from a non-science or engineering background students are immediately limited on their ability to achieve academic success due to limitations from their undergraduate degree. Many students, including myself, are prolonged from the full potential of a master's degree by being required to take multiple prerequisite courses which may go far beyond the scope of necessity for job requirements. Coming from a mixed sciences and engineering degree program of construction science, I still lacked chemistry and advanced level calculus which are not a requirement from many engineering technology or liberal arts degrees across the spectrum. If a master's degree of explosive technology would have been available prior to my enrollment it would have only made perfect sense to pursue a direction which would have made me a more qualified engineer officer and greatly reduced my total time until graduation.

As a military member, it is one of our missions to make more productive citizens for society. The master's degree in explosive technology would undoubtedly give future service members the ability to further their careers as well as allow them to make more proficient engineer officers.

Respectfully,



Nathan Skopak
CPT USAR/Engineer Officer

Dainis A. Butners
McDonough School of Business
3700 O St NW
Washington D.C. 20057

March 5, 2017

Sir/Madam:

I write to you to express my support for the Masters of Science in Explosives Technology that is being offered at the Missouri University of Science & Technology in Rolla, MO. My name is Dainis Butners and I am a proud graduate of the Explosives Engineering Department where I obtained my MS in Explosives Engineering. I pursued the graduate degree under the tutelage of the Worsesys as I needed a certification to not only capture my professional experiences as an Army Engineer but also to provide the foundation for my future success in business and international relations.

I am a graduate of the United States Military Academy at West Point, where I obtained my Bachelors in Economics. Upon graduation, I commissioned into the U.S. Army Engineer Regiment and was assigned as a Combat Engineer Officer to the 502nd Infantry Regiment, 101st Airborne Division (Air Assault). Needless to say, I quickly discovered that my military service required of me the need to become intimately familiar with explosives and explosives technology. I served as a Platoon Leader and led over 30 military engineers as we supported NATO-ISAF coalition forces through countering improvised explosive devices, instructing friendly forces on explosives safety, and utilizing over 50,000 lbs of explosives in the course of combat operations against the Taliban insurgency.

When I arrived at Ft. Leonard Wood, MO, I immediately inquired about any professional programs that would build on my hard-earned experience in explosives. I was referred to the Explosives Engineering Department at MS&T and met the Worsesys. MS&T is leading the nation in the field of explosives engineering and technology. Employers know that when an MS&T graduate is hired, that employee will be properly trained and experienced in all engineering aspects.

This was my personal experience when I applied to work with the Overseas Private Investment Corporation (OPIC) in Washington D.C. When I transitioned from Active Duty, I was enabled by my MS in Explosives Engineering to pursue unique opportunities. I was hired to be a member of their Structured Finance Department and to work in the field of project finance. I was hired not because of my financial acumen. I was hired because I was able to demonstrate my knowledge of project management, the technical aspects of extracting resources, trends within mining operations, and the underlying value drivers for the global energy industry.

I highly recommend that the University whole-heartedly supports the M.S. in Explosives Technology as it will enable people to gain critical engineering insights and prepare them for highly technical fields. I am more than happy to discuss my personal experience and how a degree from MS&T has enabled my own career success. Please contact me at my phone number (518) 605-1095 or email at db1185@georgetown.edu.

Very Respectfully,



Dainis A. Butners, MS, PMP
2015 Graduate of MS&T, Explosives Engineering



March 9, 2017

Chairman Department of Mining and Nuclear Engineering

Dear Professor Lusk;

As you know Fort Leonard Wood is the training base for the Corps of Engineers. All the 'engineer soldiers' from new privates with high school diplomas through officers with bachelor degrees are qualified to use military demolitions. Each is trained in basic explosives use, charge calculation, placement, handling, and safety. Their training includes hands-on application.

There are roughly 300 officers, 700 noncommissioned officers, and 25,000 privates each year trained on the same demolitions basics. Generally officers and a third of the noncommissioned officers have a bachelor degree underpinning their academic qualifications.

A training cadre mix of officers and noncommissioned officers do the instruction and are interested in more advanced explosive theory, practice and design. Our current program offerings with an MS Explosives Engineering has been welcomed by them and lead to an expansion with permission to conduct an undergraduate certificate at the Fort.

It appears that an MS Explosives Technology degree offering would make the offering accessible to even more soldiers.

Sincerely,

A handwritten signature in cursive script that reads "S. H. Tupper".

S. H. Tupper
Liaison to Fort Leonard Wood



Nicolas Avila
Drill & Blast Foreman
Carlin Surface

Newmont Mining Corporation
1655 Mountain City Highway
Elko, NV 89801
T 775-778-2423
M 775-397-4163
www.newmont.com

Month 23, 2017

Kyle Perry Ph.D., P.E.

Assistant Professor of Explosives Engineering
Department of Mining and Nuclear Engineering
B55 McNutt Hall, 1400 North Bishop Ave. Rolla, MO 65409

Dear Kyle,

I will try and convey the need of MST establishing an MS in Explosives Technology as this program would have been ideal in my situation. To better explain this I will give you a brief breakdown of my educational background and mining history.

I originally received an AAS in Graphic Design I worked in this industry for a few years until I was introduced into mining. I commenced my career in mining operating equipment and eventually I ended up drilling and blasting. I went to work as a surface blaster for almost 7 years and during this time I completed a BAS in Management in Technology and this allowed me to cross train in our engineering department here at Newmont. I then made the permanent move to a drill & blast engineering tech position; this further increased interest in explosives and I searched online schools that could offer an explosives or mining engineering program. I looked at MST and applied to a program however the mathematics courses I was deficient in made it difficult to justify the time commitment. I eventually found a degree that made more sense for my background and have since commenced a MEM from South Dakota School of Mines & Technology and at this time I have been at Newmont for 12 years.

Looking at this program from my perspective there is great need for a program like this in our industry. This program would allow individuals interested specifically in a career in explosives to specialize specifically on the subject. The mining industry as a whole would benefit from a degree program like the one you are proposing as it would ensure better blasting development throughout the industry.

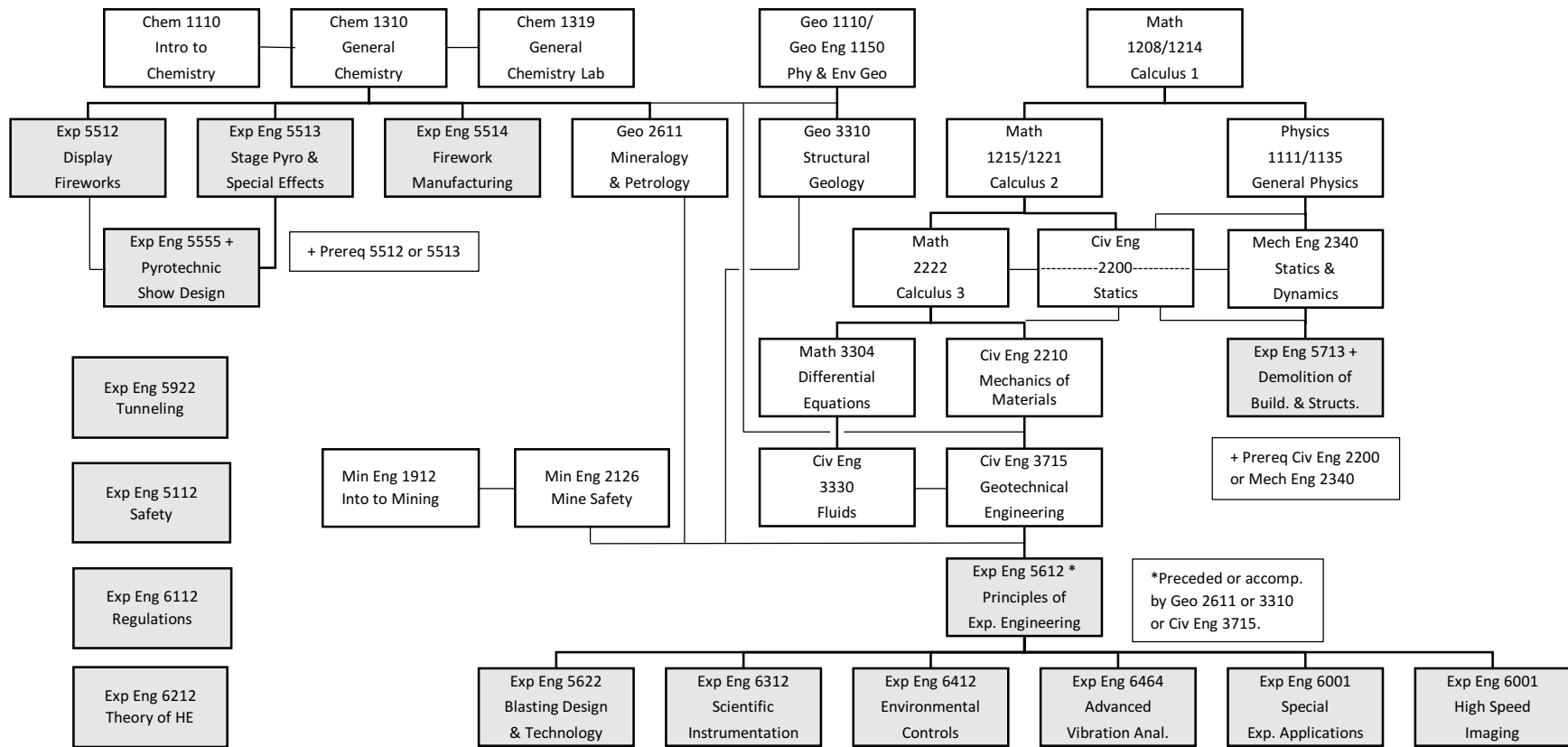
.Sincerely,

Nicolas Avila
Emigrant Drill & Blast Foreman
Carlin Surface

Appendix B

Sequence of Current Explosives Engineering Courses at
Missouri S&T

Sequence of Current Explosives Courses at Missouri S&T



Appendix C

Description of Program and Courses

Appendix C

Description of Program and Courses

Masters in Explosives Technology

The M.S. program requires a minimum of 30 hours of graduate credit. A core of four courses is required of all students, and a module of allied courses in departments outside of explosives is encouraged.

Degree Requirements

M.S. with thesis: The M.S. degree with thesis requires the completion of 24 hours of graduate course work and six hours of research (Exp Eng 6099), and the successful completion and defense of a research thesis.

Four of the following core courses are required of all M.S. students in Explosives Technology:

- Exp Eng 5612 Principles of Explosives Engineering
- Exp Eng 5622 Blasting Design and Technology
- Exp Eng 5711 Explosives in Industry
- Exp Eng 5713 Demolition of Buildings and Structures
- Exp Eng 5721 Specialty Uses of Energetic Materials
- Exp Eng 5914 Explosives Manufacturing
- Exp Eng 5922 Tunneling and Underground Construction Techniques
- Exp Eng 6112 Explosives Regulations

Students select 12 hours of Exp Eng and other appropriate elective courses. M.S. in explosives technology candidates are advised to group out-of-department courses into a module that fits their special interest.

M.S. without thesis (by coursework): The M.S. degree without thesis requires the completion of 30 hours of graduate coursework with the same stipulations as above. The six hours of research is replaced by course work which may include an explosives related cooperative work experience (Exp Eng 6070) or industry project (Exp Eng 6080) with an established company or government agency commonly using explosives and an additional explosives course.

Faculty

Faculty involved in the program include existing faculty from the Department of Mining and Nuclear Engineering at Missouri S&T and instructors from industry augmented by faculty from the Department of Civil Engineering at Missouri S&T and faculty from UMC, New Mexico Institute of Technology and Colorado School of Mines.

Professor

Paul Worsey, Ph.D., University of Newcastle upon Tyne (Missouri S&T)
Braden Lusk, Ph.D., University of Missouri – Rolla (Missouri S&T)

Associate Professor

Jason Baird, Ph.D., University of Missouri Rolla (Emeritus) (Missouri S&T)
Vilem Petr, Ph.D., Colorado School of Mines (Adjunct) (Colorado School of Mines)

Assistant Professor

Kyle Perry, Ph.D., University of Kentucky (Missouri S&T)
Catherine Johnson, Ph.D., University of Kentucky (Missouri S&T)
Soekbin Lim, Ph.D., University of Missouri-Rolla (Adjunct) (New Mexico Inst. of Technology)
Gillian Worsey, Ph.D., University of Missouri-Rolla (Adjunct) (Missouri S&T)

Adjunct Industry Instructors Currently Teaching Courses at Missouri S&T

Matt Suttcliffe Premier Pyrotechnics
Stephen Hall, M.S., Missouri S&T Hercules (Retired)
Matthew Coy, M.S., Missouri S&T Missouri S&T
Jerry Vail, M.S., Missouri S&T Missouri S&T

Catalog Description of Explosives Technology Core Courses

EXP ENG 5612 Principles Of Explosives Engineering (LAB 1.0 and LEC 2.0)

Theory and application of explosives in the mining industry; explosives, initiating systems, characteristics of explosive reactions and rock breakage, fundamentals of blast design, drilling and blasting, regulatory and safety considerations. Prerequisites: Min Eng 2126; accompanied or preceded by Civ Eng 3715 or Geology 3310 or Geology 2611; Successful background check. (Co-listed with Min Eng 5612).

EXP ENG 5622 Blasting Design And Technology (LAB 1.0 and LEC 2.0)

Advanced theory and application of explosives in excavation; detailed underground blast design; specialized blasting including blast casting, construction and pre-splitting. Introduction to blasting research. Examination of field applications. Prerequisites: Min Eng 5612. Student must be at least 21 years of age. Successful background check. (Co-listed with Min Eng 5622).

EXP ENG 5711 Explosives in Industry (LEC 3.0)

Overview of how explosives are applied in various industrial settings. Focus is placed on the general application, identification, and necessity of explosives in industry. Topics include explosive use in surface and underground mining, road development, construction, utility placement, demolition, oil, gas, and underwater.

EXP ENG 5713 Demolition of Buildings and Structures (LAB 1.0 and LEC 2.0)

Provide participants with basics and solid grounding in the equipment, techniques and processes required for the demolition and remediation of mine plant and processing equipment sites and non-mining structures such as buildings, factories, bridges, etc. Field trip required. Prerequisites: Preceded or accompanied by Civ Eng 2200 or Mech Eng 2340; US citizen or permanent resident; Successful background check.

EXP ENG 5721 Specialty Uses of Energetic Materials (LEC 3.0)

Overview of special, less common uses of energetic materials and how they can be applied as a functional tool. Topics include the use of energetics in aerospace, explosive ordnance, oil field development, welding, pyrotechnics, theatrics, and cinematic special effects.

EXP ENG 5914 Explosives Manufacturing (LEC 3.0)

History of industrial explosives from discovery to what is used today. Manufacturing processes for packaged and bulk explosives are explored along with specialty explosives such as detonating cord, cast boosters, detonators, shaped charges, and commercial fireworks. Field manufacturing of explosives by mixing or gassing is also covered.

EXP ENG 5922 Tunneling & Underground Construction Techniques (Lab 1.0 and LEC 3.0)

Advanced topics in mechanical and conventional excavation techniques in underground tunneling and construction. Topics include tunneling layouts design, equipment and performance modeling, ground control systems including support, drainage, and structural integrity. Construction specifications, advance rate and contractual and cost estimation. Students will complete a research paper or project report. Prerequisites: Min Eng 4922 or Consent of Instructor. (Co-listed with Min Eng 5622).

EXP ENG 6112 Explosives Regulations (LEC 3.0)

Comprehensive coverage of the federal regulations governing the explosives industry, including those governing storage of explosives (ATF), transportation of explosives (DOT and TSA), the environment (EPA) and use of explosives (OSM, MSHA and OSHA). Prerequisite: Graduate standing.

Salaries are based on a 2% yearly increase

NON Benefit Eligible --Part time (less than .75 FTE) and/or are Temporary

Faculty Position							
1							
2							
3							
4							
5							
		-	-	-	-	-	
Support Staff							
1							
2							
3							
4							
5							
		-	-	-	-	-	
Students (FICA exempt)							
1							
2							
3							
4							
5							
		-	-	-	-	-	
Staff Benefits (Benefit eligible)		-	-	-	19,400	32,300	38,400
Staff Benefits (Benefit non-eligible)		-	-	-	-	-	-
Total Staff Benefits		-	-	-	19,400	32,300	38,400
GTA/GRA Stipends			24,638	24,884	25,133	25,385	25,638
Departmental Operating Expenses							
Number of Employees							
Total Departmental Operating Expenses		-	-	-	-	-	-

Recurring Equipment Purchases -- Equipment that will be replaced each year

Equipment is classified into Capital and Non Capital Equipment. To be considered capital a single piece of equipment must exceed \$5000. If equipment costs less than \$5000 per item it is classified as NONCapital Equipment. Example: If you purchased six \$1000 computers these computers would be classified as Non Capital Equipment. If you purchased one \$6000 computer this computer would be classified as capital equipment.

Capital Equipment							
Please List							
Total Capital Equipment		-	-	-	-	-	
Non Capital Equipment							
Please List							
Total NonCapital Equipment		-	-	-	-	-	
Library							
Additional Databases Licenses							
Additional Publications							
Additional Other Please List							
Total Library Charges		-	-	-	-	-	
Operating Space Costs		-	-	-	-	-	
Other costs please list							
Travel							
Advertising							
Miscellaneous office							
Total Other Costs		-	-	-	-	-	
Total Recurring Costs		-	24,638	24,884	99,286	148,980	172,507
Total New Program Costs		-	24,638	94,884	109,286	158,980	182,507
Notes							
1 Departmental operating costs associated with employees	3,000	3,000	3,000	3,000	3,000	3,000	
2 Projected Flat Staff Benefit Rate	0.2772	0.2772	0.2772	0.2772	0.2772	0.2772	
3 FICA	0.0765	0.0765	0.0765	0.0765	0.0765	0.0765	

Revenue	-	33,326	109,632	209,574	267,456	292,945
Net revenue	-	8,688	14,747	100,287	108,477	110,438
Cumulative	-	8,688	23,435	123,723	232,200	342,637

University of Missouri, New Program Proposals Financial Projections, Revenues

Revenues FY2016 FY2017 FY2018 FY2019 FY2020 FY2021

State Aid CBHE
State Aid DESE

Provide Credit Hours generated within the proposed program

Please place a 1 in front of your campus Columbia Kansas City 1 Rolla St Louis

Tuition

Tuition can only be counted to the extent that students entering the program are new students from outside the university. A new program cannot count students who were already at the university but have diverted to this program from another program. In addition a new program may ONLY count the student credit hours directly attributed to the new program's classes taught. For example a new program in Life Sciences may not count a required class not in the new program in it's revenue calculation. If a program has classes that produce a supplemental fee such as engineering, these supplemental fees should be included in the analysis.

In State Undergraduate Credit Hours Generated-MU	-	-	-	-	-	-	-	-	-	-
In State Undergraduate Credit Hours Generated-MST	-	-	-	-	-	-	-	-	-	-
In State Undergraduate Credit Hours Generated-UMKC	-	-	-	-	-	-	-	-	-	-
In State Undergraduate Credit Hours Generated-UMSL	-	-	-	-	-	-	-	-	-	-
Out State Undergraduate Credit Hours Generated-MU	-	-	-	-	-	-	-	-	-	-
Out State Undergraduate Credit Hours Generated-MST	-	-	-	-	-	-	-	-	-	-
Out State Undergraduate Credit Hours Generated-UMKC	-	-	-	-	-	-	-	-	-	-
Out State Undergraduate Credit Hours Generated-UMSL	-	-	-	-	-	-	-	-	-	-
In State Graduate Credit Hours Generated-MU	-	-	-	-	-	-	-	-	-	-
In State Graduate Credit Hours Generated-MST	-	-	-	-	-	-	-	-	-	-
In State Graduate Credit Hours Generated-UMKC	-	-	-	-	-	-	-	-	-	-
In State Graduate Credit Hours Generated-UMSL	-	-	-	-	-	-	-	-	-	-
Out State Graduate Credit Hours Generated-MU	-	-	-	-	-	-	-	-	-	-
Out State Graduate Credit Hours Generated-MST	-	0	-	60	69,648	150	177,600	180	217,386	210
Out State Graduate Credit Hours Generated-UMKC	-	-	-	-	-	-	-	-	-	-
Out State Graduate Credit Hours Generated-UMSL	-	-	-	-	-	-	-	-	-	-
Subtotal	-	-	-	69,648	177,600	180	217,386	210	258,689	258,689
Educational Fee Discounting	-	-	-	36,287	92,530	-	113,258	-	134,777	134,777
Total Fees (Net)	-	-	-	33,361	85,070	-	104,128	-	123,912	123,912

Inflation 1.02 1.02 1.02 1.02 1.02 1.02

FY15 Rates	FY16 Rates	FY17 Rates	FY18 Rates	FY19 Rates	FY20 Rates	FY21 Rates
274.0	279.5	285.1	290.8	296.6	302.5	308.6
274.0	279.5	285.1	290.8	296.6	302.5	308.6
270.1	275.5	281.0	286.6	292.3	298.1	304.1
315.8	322.1	328.6	335.2	341.9	348.7	355.7
774.9	790.4	806.2	822.3	838.7	855.5	872.6
802.9	819.0	835.3	852.0	869.0	886.4	904.1
705.4	719.5	733.9	748.6	763.6	778.9	794.5
826.5	843.0	859.9	877.1	894.6	912.5	930.8
347.3	354.2	361.3	368.5	375.9	383.4	391.1
375.7	383.2	390.9	398.7	406.7	414.8	423.1
342.5	349.4	356.3	363.4	370.7	378.1	385.7
415.2	423.5	432.0	440.6	449.4	458.4	467.6
910.1	928.3	946.9	965.8	985.1	1,004.8	1,024.9
1,012.8	1,033.1	1,138.0	1,160.8	1,184.0	1,207.7	1,231.9
884.2	901.9	919.9	938.3	957.1	976.2	995.7
1,023.6	1,044.1	1,065.0	1,086.3	1,108.0	1,130.2	1,152.8

Supplemental Fees

If your program falls into the following categories, Supplemental fees are charged. Please enter the credit hours generated by the program each year in the yellow blocks.

Information Technology Fee - MU	-	-	-	-	-	-	-	-	-	-
College of Ag, Food and Natural Resources Course Fee - MU	-	-	-	-	-	-	-	-	-	-
College of Arts & Science Course Fee - MU	-	-	-	-	-	-	-	-	-	-
Trulaske College of Business Undergraduate Course Fee - MU	-	-	-	-	-	-	-	-	-	-
Trulaske College of Business Graduate Course Fee - MU	-	-	-	-	-	-	-	-	-	-
College of Education Graduate Course Fee - MU	-	-	-	-	-	-	-	-	-	-
College of Education Undergrad Course Fee - MU	-	-	-	-	-	-	-	-	-	-
College of Engineering Course Fee - MU	-	-	-	-	-	-	-	-	-	-
Engineering Excellence Course Fee - Resident - MU	-	-	-	-	-	-	-	-	-	-
Engineering Excellence Course Fee - Non-Resident - MU	-	-	-	-	-	-	-	-	-	-
School of Health Professions Course Fee - MU	-	-	-	-	-	-	-	-	-	-
Health Management and Informatics Course Fee - MU	-	-	-	-	-	-	-	-	-	-
School of Journalism Course Fee - MU	-	-	-	-	-	-	-	-	-	-
Sinclair School of Nursing Clinical Nursing Graduate Fee - MU	-	-	-	-	-	-	-	-	-	-
Sinclair School of Nursing Undergraduate Course Fee - MU	-	-	-	-	-	-	-	-	-	-
College of Human Environmental Sciences Course Fee - MU	-	-	-	-	-	-	-	-	-	-
Truman School Course Fee - MU	-	-	-	-	-	-	-	-	-	-
* Accountancy Program Fee - MU	-	-	-	-	-	-	-	-	-	-
* Medical School Laboratory/Resource Fee - MU	-	-	-	-	-	-	-	-	-	-
* Applied Music Fee - MU	-	-	-	-	-	-	-	-	-	-
Graduate eLearning and Special Program Delivery Tuition Minimum - MU	-	-	-	-	-	-	-	-	-	-
Graduate eLearning and Special Program Delivery Tuition Maximum - MU	-	-	-	-	-	-	-	-	-	-
eLearning Vet Med-Deans Certificate Courses in Vet Biomed Tech - MU	-	-	-	-	-	-	-	-	-	-
Undergrad eLearning (distance students only) - Nonresident - MU	-	-	-	-	-	-	-	-	-	-
* Examination Only - Graduate Enrollment - MU	-	-	-	-	-	-	-	-	-	-
CE Instructional Fee - Minimum - MU	-	-	-	-	-	-	-	-	-	-
CE Instructional Fee - Maximum - MU	-	-	-	-	-	-	-	-	-	-
Information Technology Fee - UMKC	-	-	-	-	-	-	-	-	-	-
Graduate Cluster 1 Supplemental Fee - UMKC	-	-	-	-	-	-	-	-	-	-
Bloch School Graduate Business Supplemental Fee - UMKC	-	-	-	-	-	-	-	-	-	-
Bloch School Undergraduate Course Fee - UMKC	-	-	-	-	-	-	-	-	-	-
Bloch School Public Administration Graduate Course Fee - UMKC	-	-	-	-	-	-	-	-	-	-
School of Education Course Fee - UMKC	-	-	-	-	-	-	-	-	-	-
Engineering Course Fee (undergrad and engineering grad cluster) - UMKC	-	-	-	-	-	-	-	-	-	-
Studio Arts Fee, UMSL (BFA), & UMKC - UMKC	-	-	-	-	-	-	-	-	-	-
Clinical Nursing Fee, MS (& Pre-Licensure level at UMKC) - UMKC	-	-	-	-	-	-	-	-	-	-
Science Lab Fee, including Geo Science - UMKC	-	-	-	-	-	-	-	-	-	-
Biological Sciences Lab Fee - UMKC	-	-	-	-	-	-	-	-	-	-

FY15 Rates	FY16 Rates	FY17 Rates	FY18 Rates	FY19 Rates	FY20 Rates	FY21 Rates
13.0	13.3	13.5	13.8	14.1	14.4	14.7
48.7	49.7	50.7	51.7	52.7	53.8	54.9
25.0	25.5	26.0	26.5	27.0	27.5	28.1
72.4	73.8	75.3	76.8	78.3	79.9	81.5
85.0	86.7	88.4	90.2	92.0	93.8	95.7
40.2	41.0	41.8	42.6	43.5	44.4	45.3
47.6	48.6	49.5	50.5	51.5	52.5	53.6
79.6	81.2	82.8	84.5	86.2	87.9	89.7
30.0	30.6	31.2	31.8	32.4	33.0	33.7
70.0	71.4	72.8	74.3	75.8	77.3	78.8
92.4	94.2	96.1	98.0	100.0	102.0	104.0
30.0	30.6	31.2	31.8	32.4	33.0	33.7
74.0	75.5	77.0	78.5	80.1	81.7	83.3
190.0	193.8	197.7	201.7	205.7	209.8	214.0
70.0	71.4	72.8	74.3	75.8	77.3	78.8
43.5	44.4	45.3	46.2	47.1	48.0	49.0
40.0	40.8	41.6	42.4	43.2	44.1	45.0
400.0	408.0	416.2	424.5	433.0	441.7	450.5
593.7	605.6	617.7	630.1	642.7	655.6	668.7
234.3	239.0	243.8	248.7	253.7	258.8	264.0
347.3	354.2	361.3	368.5	375.9	383.4	391.1
1,500.0	1,530.0	1,560.6	1,591.8	1,623.6	1,656.1	1,689.2
391.6	399.4	407.4	415.5	423.8	432.3	440.9
350.0	357.0	364.1	371.4	378.8	386.4	394.1
347.3	354.2	361.3	368.5	375.9	383.4	391.1
274.0	279.5	285.1	290.8	296.6	302.5	308.6
1,000.0	1,020.0	1,040.4	1,061.2	1,082.4	1,104.0	1,126.1
13.6	13.9	14.1	14.4	14.7	15.0	15.3
37.0	37.7	38.5	39.3	40.1	40.9	41.7
84.0	85.7	87.4	89.1	90.9	92.7	94.6
38.4	39.2	40.0	40.8	41.6	42.4	43.2
30.0	30.6	31.2	31.8	32.4	33.0	33.7
15.5	15.8	16.1	16.4	16.7	17.0	17.3
72.2	73.6	75.1	76.6	78.1	79.7	81.3
28.2	28.8	29.3	29.9	30.5	31.1	31.7
185.7	189.4	193.2	197.1	201.0	205.0	209.1
12.5	12.8	13.0	13.3	13.6	13.9	14.2
12.9	13.2	13.4	13.7	14.0	14.3	14.6

University of Missouri, New Program Proposals Financial Projections, Revenues

Revenues	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021
State Aid CBHE						
State Aid DESE						
Provide Credit Hours generated within the proposed program						
<i>Please place a 1 in front of your campus</i>	Columbia	Kansas City	1	Rolla	St Louis	
Media & Communications Studies Lab/Studio Course Fee - UMKC	-	-	-	-	-	-
* Applied Dance Fee - UMKC	-	-	-	-	-	-
* Studio Voice Fee - UMKC	-	-	-	-	-	-
* Applied Music Fee - UMKC	-	-	-	-	-	-
Graduate eLearning and Special Program Delivery Tuition Minimum - UMKC	-	-	-	-	-	-
Graduate eLearning and Special Program Delivery Tuition Maximum - UMKC	-	-	-	-	-	-
* Examination Only - Graduate Enrollment - UMKC	-	-	-	-	-	-
CE Instructional Fee - Minimum - UMKC	-	-	-	-	-	-
CE Instructional Fee - Maximum - UMKC	-	-	-	-	-	-
Information Technology Fee - MST	0	60	876	150	2,235	180
Engineering Course Fee - MST	0	60	8,742	150	22,290	180
Science Supplemental Fee for Biological Sciences and Chemistry - MST	-	-	-	-	-	-
Science Supplemental Fee for Computer Science, Geology, and Geophysics - MST	-	-	-	-	-	-
Science Supplemental Fee for Physics - MST	-	-	-	-	-	-
Business, IS&T and M&IS Course Fee - MST	-	-	-	-	-	-
Graduate eLearning and Special Program Delivery Tuition Minimum - MST	-	-	-	-	-	-
Graduate eLearning and Special Program Delivery Tuition Maximum - MST	30	33,326	60	66,652	90	99,978
* Examination Only - Graduate Enrollment - MST	-	-	-	-	-	-
CE Instructional Fee - Minimum - MST	-	-	-	-	-	-
CE Instructional Fee - Maximum - MST	-	-	-	-	-	-
Graduate Cluster 1 Supplemental Fee - UMSL	-	-	-	-	-	-
Graduate Cluster 2 Supplemental Fee - UMSL	-	-	-	-	-	-
Business School Undergraduate Course Fee - UMSL	-	-	-	-	-	-
Engineering Course Fee - UMSL	-	-	-	-	-	-
Studio Arts Fee, UMSL (BFA) - UMSL	-	-	-	-	-	-
Clinical Nursing Fee, MS - UMSL	-	-	-	-	-	-
Nursing Course Fee, BSN, 4-Year - UMSL	-	-	-	-	-	-
Science Lab Fee - UMSL	-	-	-	-	-	-
Media & Communications Studies Lab/Studio Course Fee - UMSL	-	-	-	-	-	-
Social Work Practicum Supplemental Fee - UMSL	-	-	-	-	-	-
Theater and Dance Supplemental Fee - UMSL	-	-	-	-	-	-
College of Education Supplemental Fee - UMSL	-	-	-	-	-	-
Art History Supplemental Fee - UMSL	-	-	-	-	-	-
* Applied Music Fee - UMSL	-	-	-	-	-	-
* Optometry Supplemental Fee - New - UMSL	-	-	-	-	-	-
Graduate eLearning and Special Program Delivery Tuition Minimum - UMSL	-	-	-	-	-	-
Graduate eLearning and Special Program Delivery Tuition Maximum - UMSL	-	-	-	-	-	-
UMSL Online Supplemental Fee - UMSL	-	-	-	-	-	-
Nursing Undergraduate Online Program - UMSL	-	-	-	-	-	-
CE Distance Learning Fee - Business - UMSL	-	-	-	-	-	-
CE Distance Learning Fee - Education - UMSL	-	-	-	-	-	-
CE Distance Learning Fee - Nursing - UMSL	-	-	-	-	-	-
CE Distance Learning Fee - (all Other) - UMSL	-	-	-	-	-	-
* Examination Only - Graduate Enrollment - UMSL	-	-	-	-	-	-
CE Instructional Fee - Minimum - UMSL	-	-	-	-	-	-
CE Instructional Fee - Maximum - UMSL	-	-	-	-	-	-
<i>*Flat Rate</i>	-	33,326	76,270	124,503	163,328	169,033
Institutional/Resources						
<i>It is unlikely there would any funds here unless a new program has a firm commitment for support.</i>						
Other						
<i>Examples: Sales of Educational Activities such as Clinic revenue for health related programs</i>						
Total Revenue Generated by New Program	-	33,326	109,632	209,574	267,456	292,945

C In State Undergraduate Discount Rate	0.17	-	0.17	-	0.17	-	0.17	-
C Out State Undergraduate Discount Rate	0.26	-	0.26	-	0.26	-	0.26	-
C In State Graduate Discount Rate	0.52	-	0.52	-	0.52	-	0.52	-
C Out State Graduate Discount Rate	0.80	-	0.80	-	0.80	-	0.80	-
K In State Undergraduate Discount Rate	0.16	-	0.16	-	0.16	-	0.16	-
K Out State Undergraduate Discount Rate	0.30	-	0.30	-	0.30	-	0.30	-

31.1	31.7	32.4	33.0	33.7	34.4	35.1
167.0	170.3	173.7	177.2	180.7	184.3	188.0
254.0	259.1	264.3	269.6	275.0	280.5	286.1
231.0	235.6	240.3	245.1	250.0	255.0	260.1
342.5	349.4	356.3	363.4	370.7	378.1	385.7
884.2	901.9	919.9	938.3	957.1	976.2	995.7
342.5	349.4	356.3	363.4	370.7	378.1	385.7
270.1	275.5	281.0	286.6	292.3	298.1	304.1
884.2	901.9	919.9	938.3	957.1	976.2	995.7
13.8	14.0	14.3	14.6	14.9	15.2	15.5
90.5	140.0	142.8	145.7	148.6	151.6	154.6
88.0	89.8	91.6	93.4	95.3	97.2	99.1
86.5	88.2	90.0	91.8	93.6	95.5	97.4
43.1	44.0	44.8	45.7	46.6	47.5	48.5
44.0	44.9	45.8	46.7	47.6	48.6	49.6
375.7	383.2	390.9	398.7	406.7	414.8	423.1
3,000.0	3,060.0	1,110.9	1,110.9	1,110.9	1,110.9	1,110.9
375.7	383.2	390.9	398.7	406.7	414.8	423.1
274.0	279.5	285.1	290.8	296.6	302.5	308.6
3,000.0	3,060.0	3,121.2	3,183.6	3,247.3	3,312.2	3,378.4
38.3	39.1	39.8	40.6	41.4	42.2	43.0
69.2	70.6	72.0	73.4	74.9	76.4	77.9
41.0	41.8	42.7	43.6	44.5	45.4	46.3
69.2	70.6	72.0	73.4	74.9	76.4	77.9
29.1	29.7	30.3	30.9	31.5	32.1	32.7
192.0	195.8	199.8	203.8	207.9	212.1	216.3
177.7	181.3	184.9	188.6	192.4	196.2	200.1
12.7	13.0	13.2	13.5	13.8	14.1	14.4
31.2	31.8	32.5	33.2	33.9	34.6	35.3
5.6	5.7	5.8	5.9	6.0	6.1	6.2
31.2	31.8	32.5	33.2	33.9	34.6	35.3
5.1	5.2	5.3	5.4	5.5	5.6	5.7
3.3	3.4	3.4	3.5	3.6	3.7	3.8
238.7	243.5	248.3	253.3	258.4	263.6	268.9
450.0	459.0	468.2	477.6	487.2	496.9	506.8
415.2	423.5	432.0	440.6	449.4	458.4	467.6
2,000.0	2,040.0	2,080.8	2,122.4	2,164.8	2,208.1	2,252.3
59.2	60.4	61.6	62.8	64.1	65.4	66.7
451.8	460.8	470.1	479.5	489.1	498.9	508.9
51.1	52.1	53.2	54.3	55.4	56.5	57.6
15.1	15.4	15.7	16.0	16.3	16.6	16.9
71.4	72.8	74.3	75.8	77.3	78.8	80.4
10.0	10.2	10.4	10.6	10.8	11.0	11.2
415.2	423.5	432.0	440.6	449.4	458.4	467.6
315.8	322.1	328.6	335.2	341.9	348.7	355.7
2,000.0	2,040.0	2,080.8	2,122.4	2,164.8	2,208.1	2,252.3

University of Missouri, New Program Proposals Financial Projections, Revenues

Revenues	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021						
State Aid CBHE												
State Aid DESE												
Provide Credit Hours generated within the proposed program												
Please place a 1 in front of your campus		Columbia	Kansas City	1	Rolla	St Louis						
K In State Graduate Discount Rate	0.11	-	0.11	-	0.11	-	0.11	-				
K Out State Graduate Discount Rate	0.49	-	0.49	-	0.49	-	0.49	-				
R In State Undergraduate Discount Rate	0.26	-	0.26	-	0.26	-	0.26	-				
R Out State Undergraduate Discount Rate	0.36	-	0.36	-	0.36	-	0.36	-				
R In State Graduate Discount Rate	0.43	-	0.43	-	0.43	-	0.43	-				
R Out State Graduate Discount Rate	0.52	-	0.52	-	0.52	36,287	0.52	92,530	0.52	113,258	0.52	134,777
S In State Undergraduate Discount Rate	0.16	-	0.16	-	0.16	-	0.16	-				
S Out State Undergraduate Discount Rate	0.26	-	0.26	-	0.26	-	0.26	-				
S In State Graduate Discount Rate	0.11	-	0.11	-	0.11	-	0.11	-				
S Out State Graduate Discount Rate	0.48	-	0.48	-	0.48	-	0.48	-				

Rates are calculated by pulling actual Fee and Aid numbers from the system.

University of Missouri, New Program Proposals Financial Projections, Substantially Modified Space

PLEASE only add data in the yellow blocks

A new program requires a location. Faculty and staff need office space, students need classroom space, and depending upon the program, laboratories, study space, or other miscellaneous space may be needed. Only complete the following section for **SUBSTANTIALLY MODIFIED** space needs. If there are available classrooms/offices/labs etc. not being utilized, your program could use, do not fill out the corresponding section. If there is inadequate capacity in one of these areas new or refurbished space is needed. This section will help account for one time costs such as construction/refurbishing and for recurring costs including: maintenance and repair, heating, cooling, and janitorial.

Is there space available the program could utilize? (yes/no) Yes

Please place a 1 in front of your campus Columbia Kansas City Rolla St Louis

FY2016 FY2017 FY2018 FY2019 FY2020

Complete **ONLY ONE** section below. If you know the exact square feet of space you need fill out alternative 1. If you are unsure about how much space you need, fill out alternative 2. Costs will be calculated and transferred to the expenditures worksheet so all costs can be shown together.

	<u>Initial Needs</u>	<u>ONLY include Additional Space Needed as Program Grows</u>			
Alternative 1					
Space Required (enter Square Feet)					
Office Space					
Hi Tech Classroom					
General Classroom					
Lab-Computer					
Lab-Engineering					
Lab-Science					
Lab-Research					
Miscellaneous Space					
Total Space Needed	-	-	-	-	-

	<u>Initial Needs</u>	<u>ONLY include Additional Space Needed as Program Grows</u>				
Alternative 2						
Standard Space Required(enter Square Feet)						Standard space required by square foot
Offices						150 (140-160)
HiTech Classrooms						
Classroom (<=25 students)						625
Classroom (<=50 students)						1,250
Classroom (<=100 students)						2,500
Classroom (>100 students)						3,000 (25 SF/student)
General Classrooms						
Classroom (<=25 students)						500
Classroom (<=50 students)						1,000
Classroom (<=100 students)						2,000
Classroom (>100 students)						3,000 (20 SF/student)
Lab Space 30 person lab						
Lab-Computer						1,050
Lab-Engineering						1,500
Lab-Science						3,750
Lab-Research						9,000 (intensive (varies))
Miscellaneous Space						450
Total Space Needed	-	-	-	-	-	

Rehabilitation/Construction Costs						Cost to construct per gross square foot
Office Space						185
Classroom high tech						230
Classroom general						186
Lab-Computer						186
Lab-Engineering						195
Lab-Science						249
Lab-Research						301
Miscellaneous Space						151
Total Rehab/Const Cost	-	-	-	-	-	

Recurring Costs

Columbia					
Operations, Maint & Repair					
Office Space					5.04
Classroom High Tech					
Classroom General					
Lab-Computer					
Lab-Engineering					
Lab-Science					
Lab-Research					

Miscellaneous Space	-	-	-	-	-	
Total Oper/Maint Cost	-	-	-	-	-	
Kansas City						
<u>Operations, Maint & Repair</u>						
Office Space	-	-	-	-	-	5.51
Classroom High Tech	-	-	-	-	-	
Classroom General	-	-	-	-	-	
Lab-Computer	-	-	-	-	-	
Lab-Engineering	-	-	-	-	-	
Lab-Science	-	-	-	-	-	
Lab-Research	-	-	-	-	-	
Miscellaneous Space	-	-	-	-	-	
Total Oper/Maint Cost	-	-	-	-	-	
Rolla						
<u>Operations, Maint & Repair</u>						
Office Space	-	-	-	-	-	5.57
Classroom High Tech	-	-	-	-	-	
Classroom General	-	-	-	-	-	
Lab-Computer	-	-	-	-	-	
Lab-Engineering	-	-	-	-	-	
Lab-Science	-	-	-	-	-	
Lab-Research	-	-	-	-	-	
Miscellaneous Space	-	-	-	-	-	
Total Oper/Maint Cost	-	-	-	-	-	
St Louis						
<u>Operations, Maint & Repair</u>						
Office Space	-	-	-	-	-	4.44
Classroom High Tech	-	-	-	-	-	
Classroom General	-	-	-	-	-	
Lab-Computer	-	-	-	-	-	
Lab-Engineering	-	-	-	-	-	
Lab-Science	-	-	-	-	-	
Lab-Research	-	-	-	-	-	
Miscellaneous Space	-	-	-	-	-	
Total Oper/Maint Cost	-	-	-	-	-	



- PUBLIC
- INDEPENDENT

NEW PROGRAM PROPOSAL FOR ROUTINE REVIEW

When finished, please save and email to: he.academicprogramactions@dhe.mo.gov

Sponsoring Institution:

Program Title: Explosives Technology

Degree/Certificate:

If other, please list:

Options:

Delivery Site: Missouri University of Science and Technology

CIP Classification: 142101

Implementation Date: Fall 2018

Is this a new off-site location? Yes No

If yes, is the new location within your institution's current CBHE-approved service region?

**If no, public institutions should consult the comprehensive review process*


Is this a collaborative program? Yes No

**If yes, please complete the collaborative programs form on last page.*

CERTIFICATIONS

- The program is within the institution's CBHE approved mission. *(public only)*
- The program will be offered within the institution's CBHE approved service region. *(public only)*
- The program builds upon existing programs and faculty expertise
- The program does not unnecessarily duplicate an existing program in the geographically-applicable area.
- The program can be launched with minimal expense and falls within the institution's current operating budget. *(public only)*

AUTHORIZATION

Steve Graham, Sr. Assoc. VP Academic Affairs, UM System		10/31/2017
Name/Title of Institutional Officer	Signature	Date

PROGRAM CHARACTERISTICS AND PERFORMANCE GOALS

Although all of the following guidelines may not be applicable to the proposed program, please carefully consider the elements in each area and respond as completely as possible in the format below.

Quantification of performance goals should be included wherever possible.

1. Student Preparation

- Any special admissions procedures or student qualifications required for this program which exceed regular university admissions, standards, e.g., ACT score, completion of core curriculum, portfolio, personal interview, etc. Please note if no special preparation will be required. Students will be required to meet the standard graduate school admission requirements for the M.S. degree at the Missouri University of Science and Technology and hold a bachelor's degree.

- Characteristics of a specific population to be served, if applicable.
n/a

2. Faculty Characteristics

- Any special requirements (degree status, training, etc.) for assignment of teaching for this degree/certificate.

Faculty involved in the program are based around existing faculty from the Department of Mining and Nuclear Engineering at Missouri S&T and instructors from industry currently employed on a flat rate to co-teach explosives classes. Faculty from New Mexico Institute of Technology currently teach courses approved to transfer in to S&T and faculty from Colorado School of Mines teach distance classes at their explosives laboratory.

- Estimated percentage of credit hours that will be assigned to full time faculty. Please use the term "full time faculty" (and not FTE) in your descriptions here.

Professors

Paul Worsey, Ph.D., University of Newcastle upon Tyne (S&T) (15%)

Braden Lusk, Ph.D., University of Missouri Rolla (S&T) (S&T) (5%)

Associate Professors

Jason Baird, Ph.D., University of Missouri Rolla (Emeritus) (Missouri S&T) (5%)

Vilem Petr, Ph.D., Colorado School of Mines (CSM) (CSM) (5%)

Assistant Professors

Kyle Perry, Ph.D., University of Kentucky (Missouri S&T) (15%)

Catherine Johnson, Ph.D., University of Kentucky (Missouri S&T) (15%)

Gillian Worsey, Ph.D., University of Missouri-Rolla (Adj) (Missouri S&T) (10%)

Soekbin Lim, Ph.D., University of Missouri-Rolla (S&T) (NMIT) (5%)

Adjunct Industry Instructors Currently Teaching Courses at Missouri S&T

Matt Suttcliffe (Premier Pyrotechnics) (5%)

Matthew Coy, M.S., Missouri S&T (Missouri S&T) (5%)

Stephen Hall, M.S., Missouri S&T Hercules (Retired) (5%)

Jerry Vail, M.S., Missouri S&T (Missouri S&T) (10%)

- Expectations for professional activities, special student contact, teaching/learning innovation.
n/a

3. Enrollment Projections

- Student FTE majoring in program by the end of five years.
11
- Percent of full time and part time enrollment by the end of five years.
74% and 26% respectively

STUDENT ENROLLMENT PROJECTIONS

YEAR	1	2	3	4	5
Full Time	0	2	5	6	7
Part Time	5	10	15	20	20
Total	5	12	20	26	27

4. Student and Program Outcomes

- Number of graduates per annum at three and five years after implementation.
5 and 10 respectively

- Special skills specific to the program.

Learning outcomes for the program include the following specific skills:

- Understanding and application of the functioning of explosives and initiation systems.
- Understanding and application of explosion effects.
- Understanding and application of safety as applied to explosives in field use, testing and demonstration environments.
- Experience with the safe handling of energetic materials.
- Understanding of the application of explosives for fragmenting rock and other materials.
- Expertise in focused professional areas such as demolition, blast resistance, rock breakage or weapons systems design, loading and production.
- Understanding of the challenges of using explosives and environmental impact.

Graduates will have training in explosives technology from a program that is unique the world. Graduates will be able to go into management for companies with the knowledge and background to be successful. Existing management and financial personnel (accountants) from various industries (commercial, industrial, government, etc.) will find the Explosives Technology M.S. useful when making decisions that may affect explosives use or purchasing.

- Proportion of students who will achieve licensing, certification, or registration.
n/a

- Performance on national and/or local assessments, e.g., percent of students scoring above the 50th percentile on normed tests; percent of students achieving minimal cut-scores on criterion-referenced tests. Include expected results on assessments of general education and on exit assessments in a particular discipline as well as the name of any nationally recognized assessments used.

n/a

- Placement rates in related fields, in other fields, unemployed.

n/a

- Transfer rates, continuous study.

n/a

5. Program Accreditation

- Institutional plans for accreditation, if applicable, including accrediting agency and timeline. If there are no plans to seek specialized accreditation, please provide rationale.

There is no accreditation for graduate programs in the explosives field. It is expected that the students will have bachelor's degrees from already accredited programs.

6. Program Structure

A. Total credits required for graduation: 30

B. Residency requirements, if any:

none

C. General education: Total credits:

n/a

D. Major requirements: Total credits: 12 hours

Course Number	Credits	Course Title
Exp Eng 5612	3	Principles of Explosives Engineering
Exp Eng 5622	3	Blasting Design and Technology
Exp Eng 5711	3	Explosives in Industry
Exp Eng 5713	3	Demolition of Buildings and Structures
Exp Eng 5721	3	Specialty Uses of Energetic Materials
Exp Eng 5914	3	Explosives Manufacturing
Exp Eng 5922	3	Tunneling and Underground Construction Techniques
Exp Eng 6112	3	Explosives Regulations

E. Free elective credits: 18

(sum of C, D, and E should equal A)

F. Requirements for thesis, internship or other capstone experience:

Candidates may choose to include 6 hours of research with thesis in their free elective credits but this is not required.

G. Any unique features such as interdepartmental cooperation:
n/a

7. Need/Demand

Student demand

Market demand

Societal demand

I hereby certify that the institution has conducted research on the feasibility of the proposal and it is likely the program will be successful.

On July 1, 2011, the Coordinating Board for Higher Education began provisionally approving all new programs with a subsequent review and consideration for full approval after five years.

COLLABORATIVE PROGRAMS

- **Sponsoring Institution One:**
- **Sponsoring Institution Two:**
- **Other Collaborative Institutions:**
- **Length of Agreement:**
- **Which institution(s) will have degree-granting authority?**
- **Which institution(s) will have the authority for faculty hiring, course assignment, evaluation and reappointment decisions?**
- **What agreements exist to ensure that faculty from all participating institutions will be involved in decisions about the curriculum, admissions standards, exit requirements?**
- **Which institution(s) will be responsible for academic and student-support services, e.g., registration, advising, library, academic assistance, financial aid, etc.?**
- **What agreements exist to ensure that the academic calendars of the participating institutions have been aligned as needed?**

Please save and email this form to: he.academicprogramactions@dhe.mo.gov



December 8, 2017

Dr. Mun Y. Choi, President
University of Missouri System
321 University Hall
Columbia, MO 65211

Dear President Choi:

Missouri Department of Higher Education staff has reviewed the proposal submitted by Missouri University of Science & Technology to offer the following program:

- Master of Science, Explosives Technology (*for delivery at the main campus*). The CIP for this program is 142101.

I am pleased to inform you that the MDHE has provisionally approved the program. In doing so, we understand that no new state funds will be requested through the Missouri Department of Higher Education for its support.

The department will add this information to the university's inventory on file, update the program changes in the attachment, and report changes to the Coordinating Board for Higher Education at its meeting on December 14, 2017.

I extend my best wishes for the success of these programs.

Sincerely,

Zora Mulligan
Commissioner of Higher Education

- c: Dr. Steven Graham, Senior Associate Vice President for Academic Affairs, University of Missouri System
Dr. Christopher Maples, Interim Chancellor, Missouri University of Science & Technology
Dr. Robert Marley, Provost and Executive Vice Chancellor for Academic Affairs, Missouri University of Science & Technology
Ms. Jessi Whitehorse, Program Coordinator I, University of Missouri System

Program Changes
Missouri University of Science & Technology

1) Current Program

MS, Electrical Engineering, CIP 141001

Proposed Change:

Add certificate program from approved existing parent degree

Program as Changed

MS, Electrical Engineering, CIP 141001

GRCT, Advanced Control Systems, CIP 141099 (add certificate)

2) Current Program

MS, Electrical Engineering, CIP 141001

Proposed Change:

Add certificate program from approved existing parent degree

Program as Changed:

MS, Electrical Engineering, CIP 141001

GRCT, Automation Engineering and PLC, CIP 150406 (add certificate)

3) Current Program

GRCT, Graduate Certificate in Digital Media, CIP 110401

Proposed Change:

Title change

Program as Changed:

GRCT, Digital Media and Web Design, CIP 110401 (title change)